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Business Education

THE opening of a Department of Business Administration at the London School of Economics should prove to be a very useful venture.

It is being made just when we should be equipping new entrants into business life with that higher and newer class of knowledge which specialised investigation and experimental experience have made available.

This varied knowledge, as now concentrated or collated, is considered to have been rendered essential by the changing conditions of trade and industry both here and overseas. A depressed world does not mean less keen competition; more difficult conditions demand greater efficiency.

We presume that the present movement is one outcome of the recent criticisms that have been levelled at British business men. It is a venture in education for business management, and has taken shape as the result of the joint efforts of a number of important firms and leaders, as well as academic authorities of the School. Financial aid has been forthcoming from a number of interested firms and individuals, and we are pleased to notice in the list of Subscribers given in the Syllabus such leading electrical manufacturers as the General Electric Company, Limited, and Standard Telephones and Cables, Limited.

In addition to the specially-arranged course of training in the basic principles of administration and organisation, executive control, adaptability to changes in market conditions, the principles of staff control, and the new uses of statistics, students will be afforded the privilege of attending a series of informal discussions between business men. These will deal with such subjects as marketing, retail distribution, modern accountancy, advertising, the practical aspects of importing and exporting, and so on. It is noteworthy that the scheme includes arrangements under which students may be drawn from Member Firms subscribing £50 per annum.

Those who know only too well how haphazardly the business operations of some concerns are conducted, with too many of the staff content merely with the fulfilment of the day's routine work and unmoved by vision or ambition—possibly due to want of encouragement—may think that they see in this scheme a hope and an opportunity for both businesses and their staffs to rise to a higher plane. It is believed that the experiment, for which Mr. Jules Menken will be responsible as Head of the new department, will enable competent men to take up responsible administrative duties with success in a shorter time than would otherwise be possible.

Of course, nobody supposes that mere book- or head-learning on economics and cognate general business subjects will equip a young man to become a leader or a manager if he be deficient in those other qualifications, natural and acquired, which are indispensable in men who are to be responsible for the future control of our industries at home or for effective maintenance of British traditions, and expansion of British trade, overseas. We hope we shall never imagine that any University or any School can be depended upon to provide to pattern

substitutes for the men whom Nature has loaded with exceptional gifts or those who by long and practical experience are controlling operations of great magnitude with efficiency to-day. These, happily, there always have been, and we believe always will be, emerging in every walk of life; but that does not render any less necessary the present combined effort to raise the general standard of business administration. The provision of facilities for members of commercial electrical staffs to increase their fitness, simultaneously with the carrying out of their daily duties, should be cordially welcomed by young men anxious to make their mark in business administration.

We wish the movement success and shall watch it with interest.

Gold!

ALMOST makes the mouth water! The Victoria Falls and Transvaal Power Company is in the unique position of supplying over 96 per cent. of its output to the gold mines—while even the remaining 4 per cent. is largely dependent upon the well-being of the mining industry. Mr. Arthur E. Hadley, C.B.E., the chairman and managing director, told shareholders that as gold was a primary product with a steady market and an ever-increasing demand, the industry had not only escaped the slump which had damaged almost every form of enterprise, but the actual gold production on the Reef in 1930 was a record. The Power Company therefore continues to expand, and there "is nothing to lead one to anticipate any sudden setback." The question of the rights at the Falls stands where it did. "Nothing specific to report at present," says Mr. Hadley.

Safety and Adequacy

AT first blush, a proposal to enforce "adequacy" in domestic wiring installations, to make them capable of serving all the appliances likely to be used in a house, savours of oppressive bureaucracy. Such a recommendation was made at the recent annual convention of the Canadian Electrical Association, and when the matter is properly considered the demand shows itself not to be so outrageous as it looks. At present the Canadian Electrical Code imposes conditions which ensure safety to life and property, and installations are subject to a thorough inspection. So far so good; but then the consumer—an unknown quantity—has to be contended with. In his desire to use a fire or cooker, he may turn a thoroughly safe lighting installation into a red-hot grid by the simple expedient of bridging the fuse terminals with something heavier than a 5-amp. wire. If, as the Merchandising Committee of the Association states, adequate wiring means a 30 per cent. increase in the demand for appliances, "adequacy" regulations look attractive. But we fear that compulsion cannot be thought of in this country; we must still strive to convince the architect, the builder, and the public, that adequate installations are desirable and necessary.

School and Library Lighting

TWO reports of considerable importance have just been issued by the Illuminating Engineering Society on the artificial illumination of libraries and the natural and artificial lighting of schools. In both cases the work was undertaken by a joint committee, and was thus shared by representatives of the leading professional bodies interested. Little authoritative information has hitherto been available in this country on these subjects, few, if any, precise rules or regulations being in existence at present, and the reports accordingly afford a valuable indication of good modern practice. It may confidently be expected that if the recommendations are adopted as general practice, there will be a material advance in the illumination of schools and libraries throughout the country, with a corresponding improvement in conditions for, and the performance of work by, the occupants of such premises. The school report, in particular, is timely, since many new schools are to be built within the next few years, and the opportunity will thus be provided for lighting them really well. It should be clearly understood that the recommended values of illumination, which are specified on another page of this issue, are minima only and, in certain circumstances, may be exceeded in practice advantageously. Furthermore, it should be remembered that the accumulation of dirt on fittings and glassware, depreciation of the reflecting value of walls and ceilings due to the same cause, and deterioration of the illuminant itself may cause a diminution of intensity of from 20 to 30 per cent. of the initial value in six weeks, if local conditions are sufficiently favourable. These factors should not be neglected when planning an installation in order that the minima recommended may be secured when depreciating conditions are at their worst.

Rural Electricity at Chester

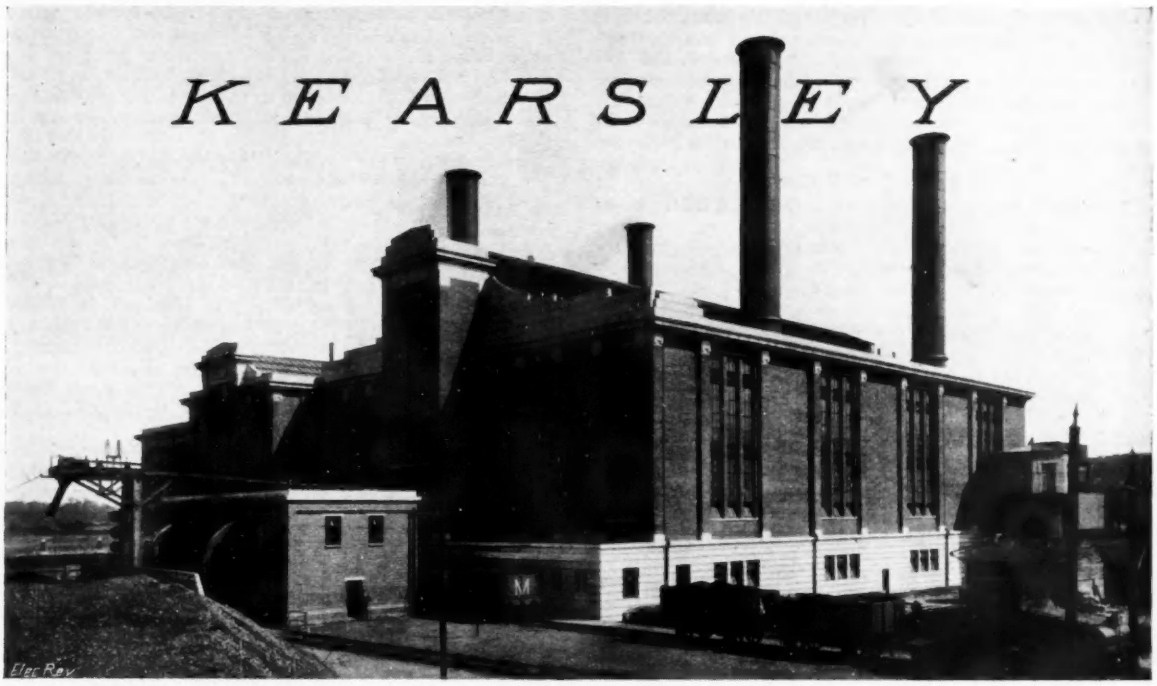
THE Chester Electricity Department was a pioneer of rural electrification at a time when the importance of this work was not so well recognised as it is to-day. Mr. S. E. Britton's latest report shows that the Department is still making headway in the country districts, and now about a third of the undertaking's consumers are in those districts. The premises connected include almost 2,000 houses, cottages and bungalows, 212 farms, 92 shops, 78 churches, chapels, and schools, and 45 hotels and inns as well as rural workshops, &c. The financial success of the undertaking during the past year has led Mr. Britton to recommend reductions during the current year in the rates charged for power and in the "all-purposes" tariff. The latter is very favourable to development in the outlying areas; it comprises a standing charge of 17½ per cent. of the rateable value (which is comparatively low in these areas) and a "unit" charge of 0.9d., which it is proposed to reduce to 0.75d. At these rates electricity should be able to make large inroads upon the preserves of older methods of cooking, heating, and working.

Flame-proof Plant Testing

ON another page is described the new testing station of the Mines Department at Buxton for flame-proof electrical apparatus. Manufacturers and users have for several years enjoyed the safeguard offered by the testing work carried out at Sheffield University, but with the growing importance of flame-proofness it is fitting that the work should be of a more "official" character. Mining work is, of course, the primary consideration, but it is nevertheless important to the electrical industry as a whole that any electrical apparatus for installation in likely explosive atmospheres can be dealt with at Buxton. The station represents in its peculiar direction an advance for British engineering practice, which is evidenced by a comparison between the great care taken to get the correct explosive mixture into the enclosures and to simulate it under running conditions with the cruder method of blowing the external atmosphere into the enclosure, as employed in other countries.

Kearsley

CONGRATULATIONS are due to the Lancashire Electric Power Co. and those of its staff responsible for the design and operation of the new Kearsley power station on the double score of the highest thermal efficiency and lowest fuel consumption for 1930 recorded in the latest "Fuel Returns," reviewed last week. Perusal of the description of Kearsley this week will add greatly to the interest of these achievements. The station follows the simplest possible design for a modern installation, with a notable absence of many of the auxiliaries which the struggle for high thermal efficiency has brought about during recent years. Midst the absorbing topic of station efficiency it is well to remind ourselves that station results depend not only on design, but also on actual operation. In the absence of mechanical aids, the attainment of high thermal efficiency reflects greater credit on those responsible for the operation.



The highest thermal efficiency and lowest fuel consumption for 1930, simplicity of plant and extreme cleanliness, render the latest station of the Lancashire Electric Power Co. of outstanding interest

ONCE again the Lancashire Electric Power Co. heads the list within the field covered by the Electricity Commissioners' Returns* for power-station efficiency in this country. This time the record is held by the company's Kearsley station, which was put into commission in October, 1929, and for which a thermal efficiency of 23.84 per cent. was obtained for the twelve months ended December, 1930. Two years ago the position now held by Kearsley was occupied by the company's older station at Padiham, which came out top for the year ended March 31st, 1929, with a thermal efficiency of 21.35 per cent. What is of particular interest is that the design of the new station follows closely that of Padiham, with simplicity of plant, a minimum of auxiliaries, uniformity of boiler firing with hand control and the use of high-grade fuel, 12,200 gross B.th.u. per lb. as fired, as the outstanding features.

Kearsley Statistics for 1930

	Output		
(1)	Total kWh generated	129,624,646	
(2)	Total kWh delivered to feeders	123,478,306	
(3)	kWh used on works	6,147,340	
(4)	Percentage kWh used on works (3)×100/(1)	4.74	
(5)	Maximum load on feeders ...	35,000	kW
(6)	Load factor	42.28	Per cent.
	Fuel		
(7)	Total weight burnt	67,907	tons
(8)	Calorific value	12,200	B.th.u./lb.
(9)	Coal per kWh to feeders ...	1.232	lb.
(10)	Coal per kWh generated	1.173	„
(11)	Ashes to dump	8.79	Per cent.
(12)	Combustible in ash	5.59	Per cent.
(13)	Flue temperature at chimney base	234	°F.
	Vacuum and Temperatures		
(14)	Vacuum at turbo exhaust ...	29.16	In Hg.
(15)	Temperature at turbo exhaust...	73.5	°F.
(16)	Temperature of circulating water inlet	53.8	°F.
(17)	Temperature of circulating water outlet	63.9	°F.
(18)	Maximum river temperature recorded	75.5	°F.
(19)	Minimum river temperature recorded	38.0	°F.
	Steam		
(20)	Gauge pressure at boilers ...	316	lb. per sq. in.
(21)	Gauge pressure at turbines ...	301	„
(22)	Temperature at boilers	697	°F.
(23)	Temperature at turbines... ...	684	°F.
	Water		
(24)	Total evaporation	1,294,960,200	lb.
(25)	Evaporation per kWh to feeders	10.487	„
(26)	Evaporation per kWh generated	9.990	„
(27)	Evaporation per lb. of coal ...	8.513	„
(28)	Evaporation per lb. of coal from and at 212°	10.59	„
(29)	Temperature of feed water to economisers	195	°F.

* ELECTRICAL REVIEW, July 24th, p. 138.

	Efficiencies		
(30)	Boiler house efficiency (35)×100/(31)	83.82	Per cent.
(31)	Turbine house efficiency 3412×100/(26)×(Heat in steam)	28.44	Per cent.
(32)	B.th.u. per kWh to feeders (8)×(9)	15,030	B.th.u.
(33)	B.th.u. per kWh generated (8)×(10)	14,310	„
(34)	Overall efficiency, units to feeders 3412×100/(32)	22.70	Per cent.
(35)	Overall efficiency, units generated 3412×100/(33)	23.84	Per cent.

The station works in conjunction with the other main generating works of the company at Radcliffe and Padiham, and is one of the permanent selected stations of the Central Electricity Board. It is designed for an ultimate plant capacity of 128,000 kW, its present capacity being 64,000 kW, but the site provides room for a still larger capacity. It stands on a site area of about 45 acres on the River Irwell between Bolton and Manchester, roughly 1.5 miles west of the Radcliffe station and on the main Manchester-Bolton L.M.S. Railway.

Coal-handling Plant

From this railway line four sidings with a total capacity of 1,500 tons and situated 75 ft. above the site serve the works, and coal is conveyed from these sidings to the works by an electric locomotive over a gradient of 1 in 27. At the station the delivery line is divided into two portions, each leading to a wagon tippler which will deal with twelve 20-ton wagons an hour. The tipplers discharge the coal into a common receiving hopper between the lines, the hopper being arranged in a building with a separate weighing room at the end from which the discharging operations are observed. From the hopper the coal falls on to two gravity bucket conveyors, each of which will deal with 100 tons of fuel per hour, and is taken to overhead bunkers in the boiler house. The bunkers are of narrow design with the object of affording as much light as possible to the firing floor and also to facilitate levelling operations. There are eight main bunkers, one per boiler, each having a capacity of 150 tons. They discharge through gate valves into the usual arrangement of oscillating chutes feeding the boiler hoppers.

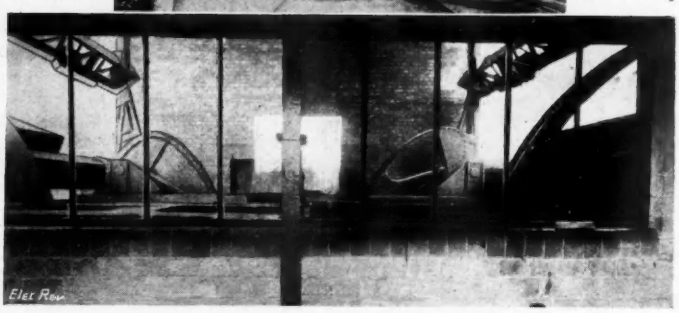
Arrangements are in vogue, for the time being, for ground stocking some 18,000 tons of coal, and this is taken from a special bunker, situated adjacent to the main bunkers, from which the coal is conveyed to the stocking ground by a belt system and distributed over the ground by a drag-scraper plant which is also used for reclaiming the coal when the fuel is drawn into a further special hopper connected up to the gravity-bucket conveyor system.

A well-equipped coal-sampling room plays no meagre part in the station's success. In it are special sampling apparatus, drying ovens, crushers, &c., and the final samples of fuel are prepared for analysis. One man is fully employed on the

sampling work. There is a well-equipped laboratory the work of which is controlled by a qualified chemist and assistants who deal with the routine testing of coal, water, oil, &c. The equipment includes the latest types of instruments for quantitative and qualitative analyses, and a special feature is a calorimeter in a glass case; to reduce errors to a minimum the readings are taken by a telescopic arrangement outside the case.

Boiler Installation

The boilers are of the Babcock & Wilcox C.T.M. marine water-tube type and are liberally rated each at 75,000 lb. per hour. They are all stoker fired. Provision is made for the ultimate installation of double the present capacity of boiler plant, *i.e.*, a total of 16 boilers of the size of those now in operation. The stokers are of the B. & W. chain-grate type without compartments, but they are closed in at the front to permit the use of forced draught. There are two stokers per boiler, each 11 ft. wide. The furnaces are of comparatively large size, the lower ends of the water tubes being 13 ft. 6 in. above the grate firing level. "Liptak" suspended arches are provided at the fronts of the grates, and ordinary sprung-type arches at the backs. The superheater of each boiler is arranged above the first pass of water tubes, and for accessibility it is placed in a separate chamber. The outlet gases from each unit are carried through a horizontal duct to the rear of the boiler, and they pass down through the Green tri-tube economiser and air heater to the basement level where the induced-draught fan is situated. The gases pass out direct to the stack, no grit catchers of any description being employed. By virtue of the layout being designed to give very low velocities to the outlet gases the grit separates from the gases proper and settles in the flues and at the base of the stack. The boiler and economiser heating surfaces are 11,676 and 8,496 sq. ft., respectively. The boiler steam conditions are 315 lb. per sq. in. and 720 deg. F. Each air heater is of the B. & W. tubular type with an operation area of 11,713 sq. ft., and it receives air direct from the forced-draught fan situated in the basement, the heated air being carried in horizontal ducts direct to the front of the stoker. The preheated air temperature is 200 deg. F. The boiler firing is managed by simple hand control throughout. The dimensions of the existing boiler room are 123 ft. wide, 163 ft. long, and 66 ft. high.



Coal-handling Plant; Tipplers from Weighing Room

The boilers, economisers and air heaters have brick settings of an unusual arrangement. A steel frame forming part of the main structure of the unit is arranged outside the normal brickwork, and the spaces between the girder work are filled in with brickwork in the form of arches. This results in additional strength to the structure and also in aiding the heat insulation of the boiler by sealing the air in the interstices between the two walls.

The make-up water for the boilers is taken from the River Irwell and is first treated in a simple lime and soda plant supplied by Kennicott Water Softener Co., Ltd., and is then passed through a natural zeolite equipment made by the same firm. The result of this dual treatment is that the hardness of the water is reduced to zero and the alkalinity to 0.2 deg. This method of water treatment is in vogue at all three of the company's main stations—Padiham, Kearsley and Radcliffe—with the result that no internal cleaning of any kind of the boilers is required.

The ashes are discharged into hoppers large enough to permit of one working shift per day. For removal they are dropped into 10-cwt. buckets suspended from ball-bearing rollers on a mono-rail and conveyed by an aerial ropeway to a distant part of the site where they are either dumped or discharged into a hopper for filling lorries.

An important feature of the station is the simplicity of the steam piping. Corrugated bends are used to provide for the necessary expansion. The joints are all of the "Corwel" welded type by Aiton & Co., Ltd., and no steam leak has yet been experienced with this type of joint in the station.

In the manufacture of the "Corwel" joint a corrugation is first formed on the end of the pipe, the thickness of the material being maintained and even increased. The corrugation is then closed back in a special die, which maintains the radius of the curve where the corrugation starts from the pipe. The curve allows for some elasticity in the joint, the folded-back portion can be faced off so that true alignment can be maintained, and closers can be made a true fit. Stresses in the joint are taken by the bolts, and the weld is only to make a steam-tight joint, and takes the place of packing. The makers are, however, able to use a heavy weld, and the joints have withstood a hydraulic test pressure of 1,000 lb. per sq. in. without bolts.

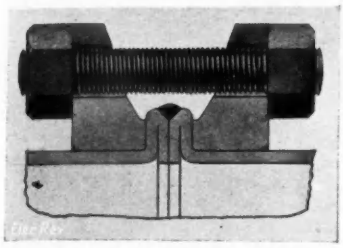
The whole of the steam and water valves were supplied by J. Blakeborough & Sons, Ltd., and the whole of the steam and water pipes are of Aiton manufacture.

Looking Down Firing Aisle of Boiler Room

Arched Boiler Walls

Turbine Plant

The existing turbine room measures 53 ft. wide by 213 ft. long by 73 ft. high, and houses two 32,000-kW turbo-alternators, although the station lay-out provides for the installation of two similar sets in the future. The generating sets were supplied by the British Thomson-Houston Co., Ltd., the turbines being of the company's two-cylinder, single-flow type, having a speed of 15,000 r.p.m. The economical loading of each turbine is 25,600 kW. Each turbine is bled at two points, the condensate being heated to 160 deg. F. in the l.p. heater and to 200 deg. F. in the h.p. heater. The condensate passes through a Kent Venturi meter before it reaches the boiler feed pumps.



Construction of "Corwell" Joint

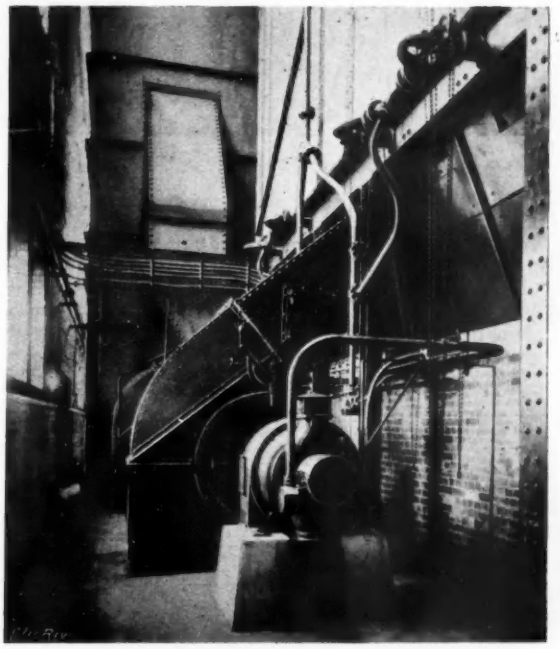
The whole of the condensing plant was supplied by Worthington-Simpson, Ltd. The condensers are of the surface type, a single unit being served by each turbine and positioned beneath the machine. Each condenser has a cooling area of 36,000 sq. ft. and is fitted with 1-in. diameter tubes on account of the dirty river conditions. Each condenser is designed to maintain a vacuum of 28.75 in. when supplied with circulating water at an inlet temperature of 65 deg. F. Spring supports take the weight of the condensers off the turbines. The air and condensate pumps for each main machine are arranged in duplicate, each pair of pumps being driven by one 140-h.p. motor. The air pumps are of the hydraulic type. No steam jets are used, while an unusual feature for a modern station is the complete absence of evaporators and deaerators of any description; in fact the only place where steam is fed in the turbine room is at the main stop valves of the turbines. This arrangement has resulted in very great simplicity of lay-out and operation.

There is also installed in the turbine room a small 375-kW B.T.-H. turbo-alternator, 400 V, 3-phase, 50 cycles, for supplying the turbine-room auxiliaries in the event of a total failure of the supply. The whole of the motors throughout the station are supplied at 400 V, 3-phase, and the boiler-house auxiliaries are supplied from a separate transformer system connected to the main station bus-bars. The turbine-room auxiliaries can, however, be driven either from these transformers or from the house generators carried on the main turbine shafts. For reliability the turbine subsidiary plant is generally supplied half from the house generators and half from the transformers.

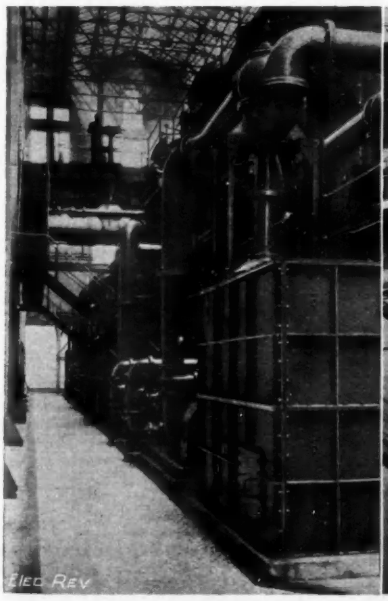
The condenser circulating pumps are situated in a separate pump house on the river bank. Two pumps serve each main generating unit, each pump being driven by a 300-h.p. motor, 480 r.p.m., and capable of delivering 20,000 gallons of water per hour and of providing for 60 per cent. of the maximum output of the generator. The pumps are positioned about 10 ft. above the normal river level, and the glands are specially water sealed to prevent leakage trouble resulting from the suction lift. The circulating water is conveyed from the pumps to the turbine house through welded steel piping arranged in a tunnel to give ample accessibility to every joint. On the suction side at the river there are five disk-type rotary screens by Blakeborough & Sons, Ltd., and each screen is driven through a special friction drive to reduce maintenance to a minimum. The water in the river is maintained at a minimum level by a heavy concrete weir constructed across the river at a point about 350 yd. below the pump house, thus forming a comparatively large pool. The circulating water is discharged into the river at a point 1,200 ft. from the pump house.

Electrical Equipment

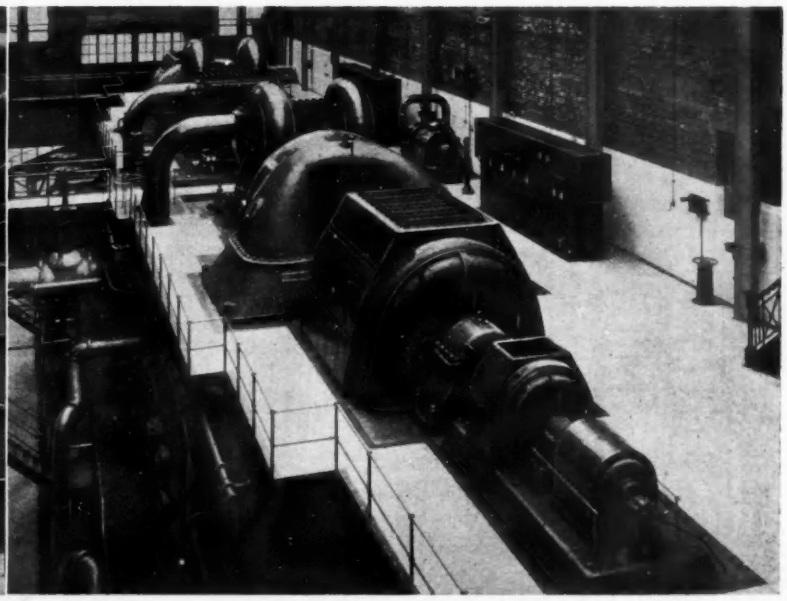
Each turbine drives a main alternator, auxiliary service alternator, and a stabilised exciter set. The closed-air circuit system of ventilation in conjunction with the makers' air coolers is used for the main alternator, which is maximum rated 44,700 kVA, 70 per cent. p.f., 11,000 V, three-phase, 50 cycles. Each main alternator is solid-coupled to a main 11,000/33,000-V transformer bank, and all the switching is carried out at the higher pressure. Each auxiliary service alternator is rated at 1,250 kVA, 80 per cent. p.f., 400 V, three-phase, 50 cycles. The stabilised exciter set consists of a main and service exciters, the latter providing the field excitation for the auxiliary service alternator as well as for the main exciter, which in turn provides the field excitation for the main alternator. This arrangement, in conjunction with a Tirrill voltage



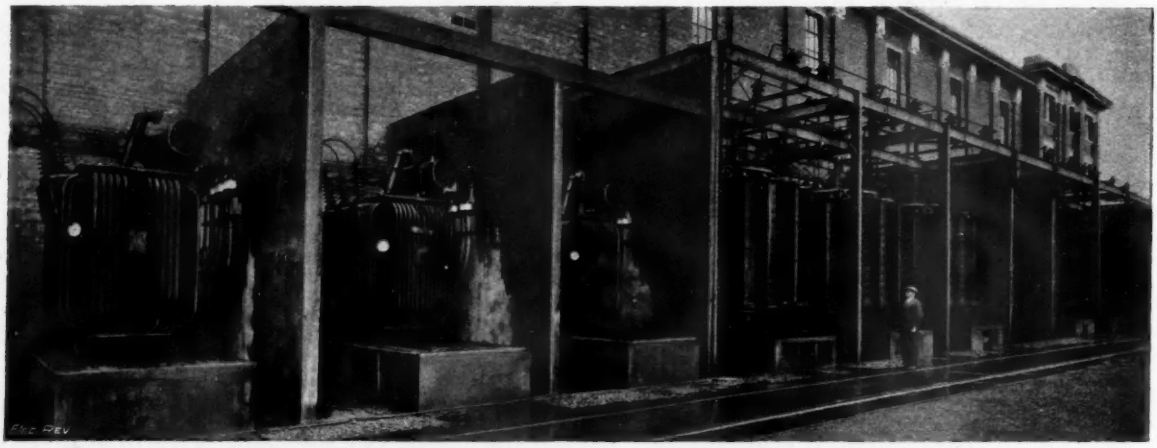
Induced-draught Fan at Base of Stack



Condenser Basement



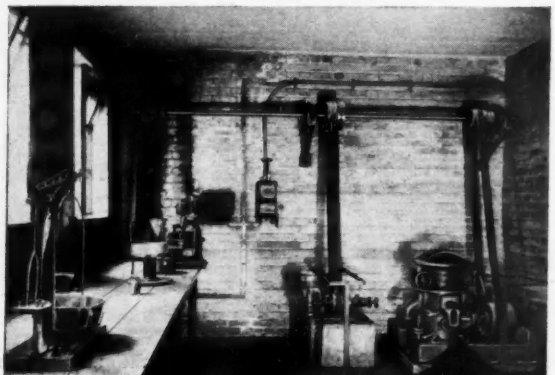
Turbine Room; Two 32,000-kW Sets



Auxiliary (1,250-kVA) and Main (14,000-kVA) Transformers; Single-phase Units

regulator for each main alternator, ensures stability of the bus-bar voltage. Earthing of the neutrals of the alternators is, of course, effected at 11,000 V, and meters are installed on the alternator side of the transformers, the instruments being calibrated so that, in effect, the metering takes place on the 33,000-V side.

The transformers are 14,000-kVA single-phase units of the "air-jet," self-cooled outdoor type, arranged in two three-phase banks, with one spare. Each bank is connected in delta on the 11,000-V side, and in star on the 33,000-V side. A separate conservator is supplied with each bank, the conservator being mounted on a wall adjacent to a transformer bank, and supported by steel work. There is also provided a very full complement of apparatus for testing, treating and conditioning the oil, there being included two oil tanks, each having a capacity of 3,000 gal., a De-Laval oil-testing set, and an Alfa-Laval centrifuge and auxiliary pump, &c. To assist in moving a transformer when on the ground the under-carriage is fitted with flanged rollers of standard rail gauge and draw eyes. The station equipment includes two rail transfer trucks by means of which a transformer unit can be readily removed from the bank into the power house, and the spare unit, which is kept in the power house, brought out and connected in circuit in a very short time.

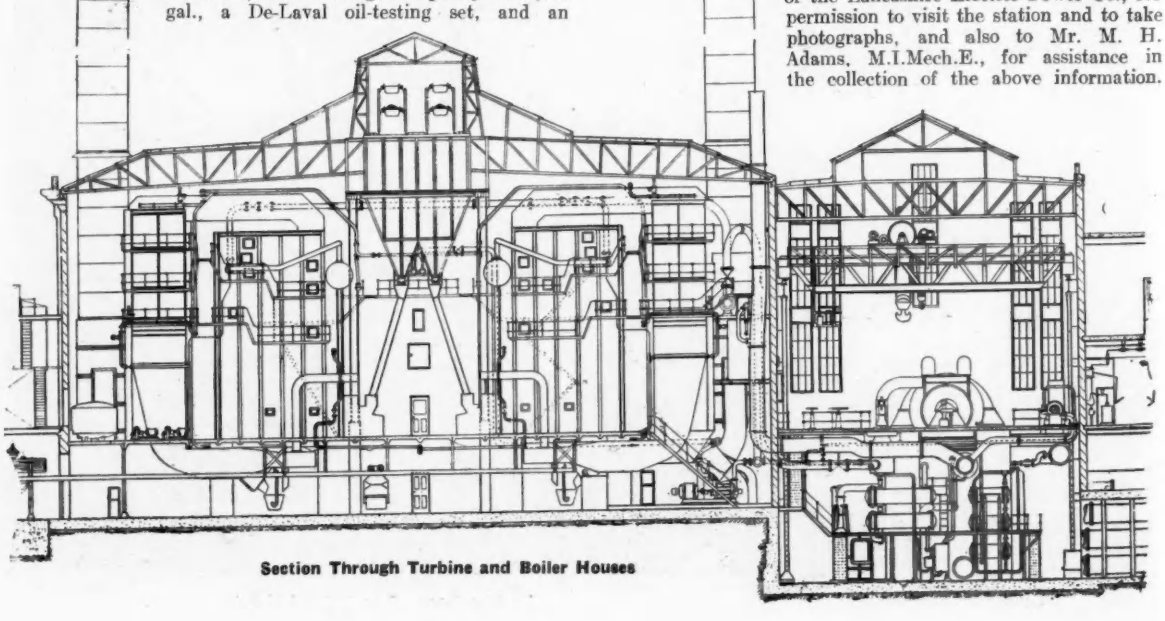


Equipment in Coal-sampling Room

The 33,000-V generator and feeder B.T.-H. switching equipments are of the stone and steel cellular type, incorporating duplicate bus-bars and the makers' type-H oil circuit breakers with a rupturing capacity of 1,000,000 kVA. In addition to the 33,000-V bus-bars there is a system of 400-V bus-bars supplied from three 33,000/400-V, three-phase transformers for driving the boiler-house auxiliaries and also a portion of the auxiliaries in the turbine house. These transformers are each rated at 1,250 kVA, and are of the oil-immersed, self-cooled type, with external cooling tubes. The remaining portion of the turbine-house auxiliary plant is supplied from the auxiliary service alternators on the main shaft of each machine. The control room is spacious and simple in lay-out, and is equipped with standard B.T.-H. panels.

At the north side of the station there is a complete set of offices for the engineering staff, &c. The whole station is of steel and brick construction, the outside being faced with Accrington bricks and artificial Portland stone. The generally fine appearance of the interior of the station is contributed to considerably by the "Marbello" flooring in the turbine room and the stainless-steel hand rails throughout. The whole of the building work, including the civil engineering, was carried out by J. Jarvis & Sons, Ltd., who were also responsible for the whole of the similar work in connection with the company's station at Padiham. The station was designed and constructed under the supervision of Dr. H. F. Parshall, the consulting engineer to the Power Company.

Our thanks are due to Mr. C. D. Taite, M.I.E.E., director and engineer of the Lancashire Electric Power Co., for permission to visit the station and to take photographs, and also to Mr. M. H. Adams, M.I.Mech.E., for assistance in the collection of the above information.

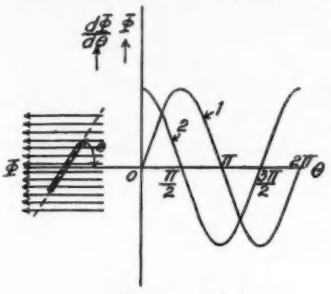


Section Through Turbine and Boiler Houses

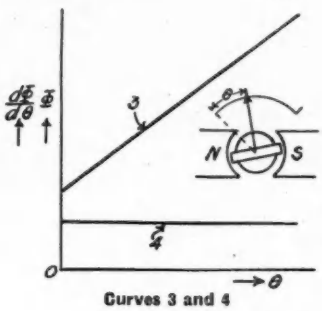
Torque in Instruments. By J. L. Ferns, Grad. I.E.E.

A method of determining the characteristics of the moving-iron and dynamometer types

IN the case of the permanent-magnet moving-coil instrument it is fairly easy, owing to its symmetrical construction, to obtain an expression for the torque. Other instruments are not so ideal in this respect, and it is not always easy to determine the torque expression. Consequently many teachers omit to discuss torque calculations in instruments other than the above mentioned type. This is rather unfortunate because it often leaves the student with rather erroneous ideas as to the nature of the torque in moving-iron and dynamometer instruments. It is hoped that this article will be of assistance to electrical students.



Curves 1 and 2



Curves 3 and 4

Let T = Torque in dyne-cm.
P = Potential of the moving system.
F = Flux lines passing through the coil.
I = Current in the coil in amperes.
N = Number of turns in the coil.
θ = Angular displacement in radians from a given position.
t = Time in seconds.
1 gram-cm. = 981 dyne-cms.
1 joule = 1 watt-second = 10^7 ergs.

A body is said to have a potential of P units if it is capable of doing P units of work by reason of its position. Therefore a current-carrying coil which is in a magnetic field has in most positions a potential. We shall discuss here the action of the coil on a rotational basis only. If the flux F changes, then an e.m.f. is induced in the coil which is proportional to the rate of change of the flux linkages, *i.e.*, d (N.F.)$/dt \times 10^{-8}$ volts. If the steady current in the coil is I amperes, then the work done on or by the coil during a tiny interval of time dt is $(I \times d(F.N.)/dt \times dt) \times 10^{-8}$ joules. This reduces to $N.dF.10^{-8}$ joules, since N is a constant. If the flux changes from 0 to F, then the total work done on or by the coil is $10^{-8} \int_0^F N.dF$ joules, *i.e.*, 10^{-8} N.F, since I and N are constants and $\int_0^F dF$ equals F. Therefore the potential of the coil is N.F. 10^{-8} joules, or N.F. 10^{-1} ergs.

If the coil is supposed to move through a tiny angle $\delta\theta$, the torque during this motion can be assumed constant. Therefore the work due to the motion is equal to $T.\delta\theta$. Clearly the coil has lost or gained in potential by the same amount according to the directions of the motion, current and flux.

$\therefore \delta P = T.\delta\theta$.

$\therefore T = \delta P/\delta\theta = dP/d\theta$, when the increments approach zero.

$\therefore T = d(N.F)/d\theta_{10^{-1}} = N.dF/d\theta \quad 10^{-1}$ dyne-cms. .....Equation 1.

Thus, to determine the torque on or due to a coil in a magnetic field we require to know the law connecting the flux and the angle θ. For cases in which a knowledge of the flux is rather vague, as in moving-iron instruments, the problem may be tackled in a slightly different manner. If the inductance of the coil for a definite position of the moving system is L henries, then the e.m.f. induced in the coil, if the current changes at the rate dI/dt is $L.dI/dt$ volts. Hence the work done on or by the coil in time dt is equal to $L.L.dI/dt.dt$, *i.e.*, L.L.dI joules. The work due to changing the current from 0 to I is equal to $\int_0^I L.L.dI$ joules. Since L is a constant and $\int_0^I I.dI$ equals $\frac{1}{2}I^2$, then the potential of the coil is equal to $\frac{1}{2}L.I^2\ 10^7$ ergs. Consequently the torque on the coil is the differential of $\frac{1}{2}L.I^2.\ 10^7$ with respect to θ.

$\therefore T = \frac{1}{2}I^2\ dL/d\theta.10^7$ dyne-cms. .....Equation 2.

For the dynamometer instrument equation 1 can be expressed in another form. Let M be the mutual inductance in henries between two coils, and let the coils be denoted by the suffixes a and b. If the current in coil b changes at the rate dI_b/dt, then an e.m.f. $M.dI_b/dt$ volts is induced in coil a. Therefore the work done on or by coil a (if it is carrying a steady current I_a) in time dt is $I_a M.dI_b/dt.dt$ joules, *i.e.*, $I_a.M dI_b$ joules. If the current in coil b changes from 0 to I_b amperes, then the work due to the change is clearly $I_a I_b M$ joules. Therefore the potential of the coil a is $I_a\ I_b.M.10^7$ ergs. It may be similarly proved that the potential coil of b is also $I_a.I_b.M.10^7$ ergs. Consequently the torque on each coil is the differential of this expression with respect to θ.

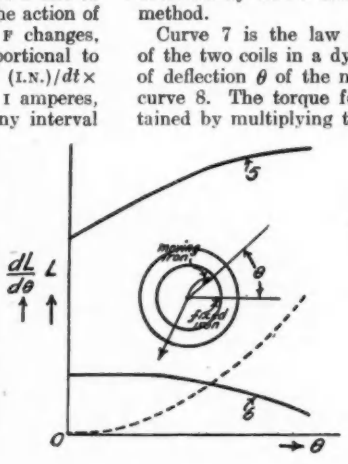
$\therefore T = I_a.I_b.dM/d\theta\ 10^7$ dyne-cms. .....Equation 3.

We are now in a position to appreciate the accompanying diagrams. Curve 1 is the law connecting flux and the angle θ for a simple coil in a uniform magnetic field. This is a sine curve, and therefore its differential $dF/d\theta$ is a cosine curve, *i.e.*, curve 2. The torque for a certain angular position is obtained by multiplying the appropriate ordinate of curve 2 by $N.10^{-1}$ (see equation 1).

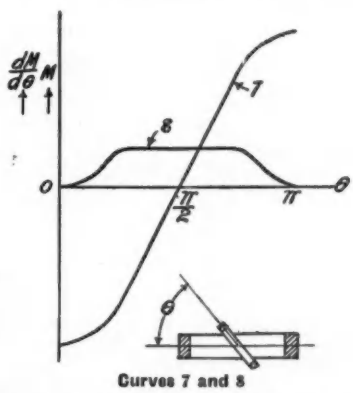
Curve 3 is the law connecting the flux and the angle θ for the coil of a permanent-magnet moving-coil instrument. Its differential is curve 4. The torque, in dyne-cms., for a certain angular position is obtained by multiplying the appropriate ordinate of curve 4 by $N.10^{-1}$; N is a constant and, if the instrument is well designed and constructed, $dF/d\theta$ is also a constant, which makes the torque proportional to the current I. Hence the uniform scale of this type of instrument.

Curve 5 is the law connecting the self-inductance of a moving-iron instrument with the angle of deflection of the moving system from zero. Its differential, $dL/d\theta$, is curve 6. The torque, in dyne-cms., for a certain angular deflection is obtained by multiplying the appropriate ordinate of curve 6 by $\frac{1}{2}I^2 10^7$ (see equation 2). The dotted curve gives an idea of the way in which $\frac{1}{2}I^2$ varies with θ, and hence the reason why the scale is so cramped near zero. Curve 5 is obtained by direct measurement, and curve 6 by a graphic method.

Curve 7 is the law connecting the mutual inductance of the two coils in a dynamometer instrument with the angle of deflection θ of the moving coil. Its differential, $dM/d\theta$, is curve 8. The torque for a certain angle of deflection is obtained by multiplying the appropriate ordinate of curve 8 by



Curves 5 and 6



Curves 7 and 8

$I_a.I_b.10^7$ (see equation 3). As it is usual to use only the region between 45 and 135 degrees for deflectional purposes, the reason for the uniform scale of the wattmeter and the square-law scale of the dynamometer ammeter and voltmeter will now be clear.

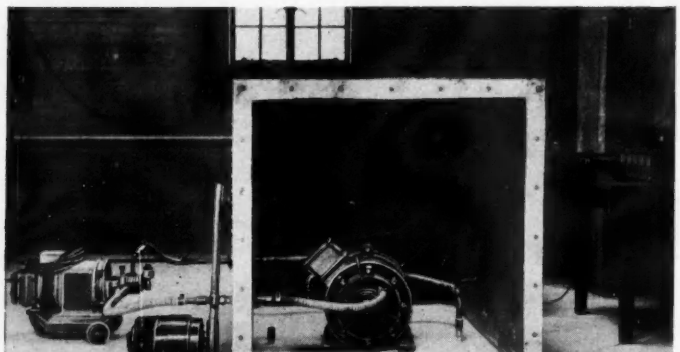
A Nocturnal Sun-dial

A nocturnal sun-dial, using light instead of shadow to tell the time, is to be installed by the municipality of Guayaquil, Republic of Ecuador. In gardens along the waterfront of the port a Moorish tower is being erected to hold an old historic clock dating back to 1841. A large airport beacon will be mounted on top of the tower and will make one complete revolution every twelve hours. The 24-in. beacon with a 1,000-watt lamp was purchased from the International General Electric Company. Impulses from a telechron electric clock will be transmitted to solenoid-operated turning mechanism every five seconds through the medium of a standard traffic timer. Thus the beacon, as it turns, will indicate the time by illuminating various landmarks at the same time each night.

The New Buxton Mines Department Testing Station

Designed to deal with flame-proof electrical apparatus for use in industries where explosive atmospheres are likely to be encountered

AS a result of the decision of the Mines Department officially to take over the testing of flameproof enclosures for electrical apparatus to be used in industries where explosive atmospheres are likely to be encountered, which work had been carried out at the testing station at Sheffield University for many years, the new testing station at Harpur Hill, Buxton, has been established. It has been planned in the light of the experience gained from the testing work carried out at Sheffield, and it has been built on the site of the existing experimental station of the Safety in Mines Research Board situated at a comparatively isolated spot on the Derbyshire Hills a few miles from Buxton town. Although it is concerned primarily with the coal-mining industry, it will also deal with apparatus used in petrol stores, chemical works, oil tankers, &c. Mr. H. Rainford, who was the research and testing officer at the University station, has been officially appointed as testing officer at Buxton under the direction of Mr. J. A. B. Horsley, chief electrical inspector of mines.



Rectangular Chamber, showing Motor in Test position and Circulating and Fan Motors

There are two main buildings of simple concrete construction—a main testing house with a gas-holder annexe and a smaller structure embracing a combined observation room and laboratory and the testing officers bureau. The observation room is normal to the test house, and a horizontal "slit" window in its end wall commands a view of the testing equipment. There is a similar observation window in the sliding door to the gas-holder annexe. The front and one side of the test house are served by sliding doors, and openings in the roof provide adequate ventilation in cases of explosion. A siding from the Ladmanlow branch line of the L.M. & S. Railway serves the station as a whole and is linked up with the interior of the testing house by a light railway.

Testing Equipment

There are four testing chambers of different sizes and shapes which will accommodate between them an extensive range of apparatus from small switches to large motors and circuit breakers. A rectangular steel (sides and back) chamber, 7 ft. by 4 ft. by 4 ft., mainly for coal cutters, is disposed horizontally and is embedded in the floor at the bottom. Two iron cylindrical chambers (open ends), 6 ft. high by 4 ft. dia. and 5 ft. high by 5 ft. dia., respectively, are water-sealed at the bottoms when in position and are lowered over the apparatus to be tested. The fourth chamber is of wood, 2 ft. 6 in. cube, with a glass window in one side, and in addition to testing very small appliances it is used for experimental work. Each chamber is finally sealed by oiled paper vents which will relieve the pressure inside in the event of explosion occuring.

A main pipe line extending the length of the building connects a large gasometer outside and the smaller ones in the annexe, and branches terminate in two short projections through the floors of each test bed. One projection is connected to the apparatus to be tested to fill the enclosure with prepared explosive mixture, and the other is left open to the actual chamber interior to surround the apparatus under test with explosive mixture by introducing pure gas or vapour and mixing it with the air by a fan motor driven from outside the chamber. During this mixing process, samples of the atmosphere are periodically drawn out into gas-sampling apparatus and exploded under observation for checking the percentage composition of the mixture, and a final sample is withdrawn for analysis as a check on the observation method.

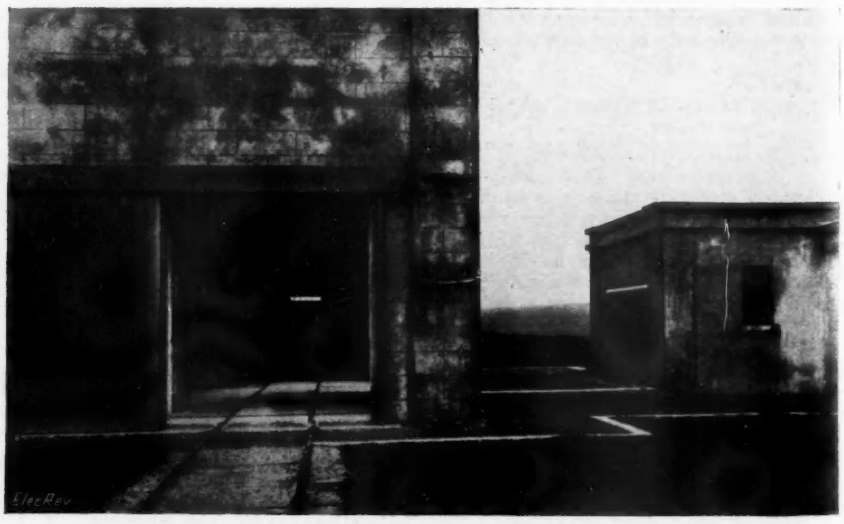
The prepared explosive mixture for filling the enclosures to be tested is carefully made up in the small gasometers and analysed to ascertain the exact composition before use. Provision is made in the pipe line for connecting a motor-driven circulating pump to the enclosure under test, so as to force the explosive mixture into the apparatus, a sufficient quantity of the mixture being passed through to clear the casing of air and finally to leave it filled with the required mixture. The ignition of the explosive mixture inside the apparatus under test is effected either by blowing a fuse in the mixture or by the discharge from an induction coil across a spark plug in the same position.

Test Procedure

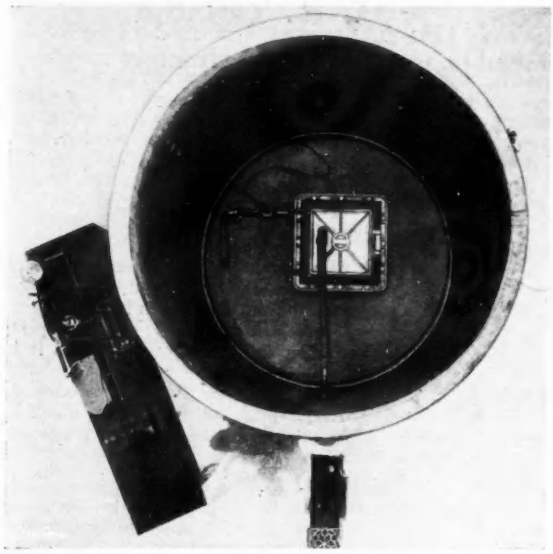
Drawings are submitted by the manufacturers with their applications, and are examined to see whether the design meets the requirements for flameproof enclosure. If so, the apparatus is accepted for test, and if not, the manufacturers are informed, so that modifications can be made in the design stage. On arrival at the testing station the apparatus is examined to ensure compliance with the approved design as indicated on the drawings, and if it passes this examination it is subjected to tests as follows.

Preliminary tests are made for observation purposes, during which, records of the pressures developed within the casing are obtained. The preliminary tests are made without a surrounding explosive atmosphere, so that close observation can be made of the efficiency of joints, &c., and so that the general ability of the enclosure to withstand internal explosions can be determined.

The manometer and auxiliaries for the pressure tests are arranged as a complete unit on a table which can be taken to any of the test beds. The pressure records obtained give valuable information which is passed on to the manufacturer who can make a comparison between the pressure actually developed on test and that for which the enclosure was originally designed.



Disposition of Buildings; Test House Left (Gasometer Annexe Far Interior), Observation House Right; Note Observation Windows



Looking Down into one of the Cylindrical Chambers; Gas-sampling Apparatus at Side

For the final tests the internal explosions are repeated whilst the apparatus is surrounded by an explosive atmosphere similar to that used for the internal explosions.

In general, the object of the tests is to determine by actual explosion experiments whether the apparatus under test will withstand the pressure developed within the enclosure and at the same time will securely prevent an internal explosion from giving rise to an ignition of the surrounding explosive atmosphere.

For tests on motors the machines are not run under power, but a scheme has been developed to simulate the conditions of turbulence within the motor when it is running. A circulating pump is connected to the motor enclosure to form a closed system, so that the explosive mixture can be ignited while it is moving in the enclosure.

Certified Apparatus

A certificate of flame-proofness is issued by the Mines Department for all apparatus which passes the tests described and which also meets the requirements laid down for the design of flame-proof enclosures. The British Engineering Standards Association has issued several specifications dealing with the design of such apparatus, and others are being prepared, so that the Mines Department is much assisted by the B.E.S.A. B.S.S. No. 229-1929 for "Flame-proof enclosures for electrical apparatus (for use in mines and other places where an explosive atmosphere may be encountered) and tests for flame-proof enclosures" contains the following clause:—

"The design and construction of flame-proof apparatus submitted for test and certificate should comply, as regards flame-proof enclosures, with the B.S.S., if any exists, for such apparatus, but if there is no such specification then the principles of design and construction, as regards flame-proof enclosure, in any appropriate B.S.S. should be observed."

Mr. Rainford stressed to our representative the importance of the latter part of this clause, which appears not to be generally realised among manufacturers.

Applications for test must in the first instance be addressed to the Under Secretary for Mines at the Mines Department, London, and these applications should be accompanied by drawings showing full details of the flame-proof features of the design, the drawings being dealt with as outlined under "Test Procedure."

Floodlighting London Buildings

FURTHER experiments in floodlighting in preparation for the extensive illuminations which are being arranged for the period of the International Illumination Congress in September were carried out in London last week.

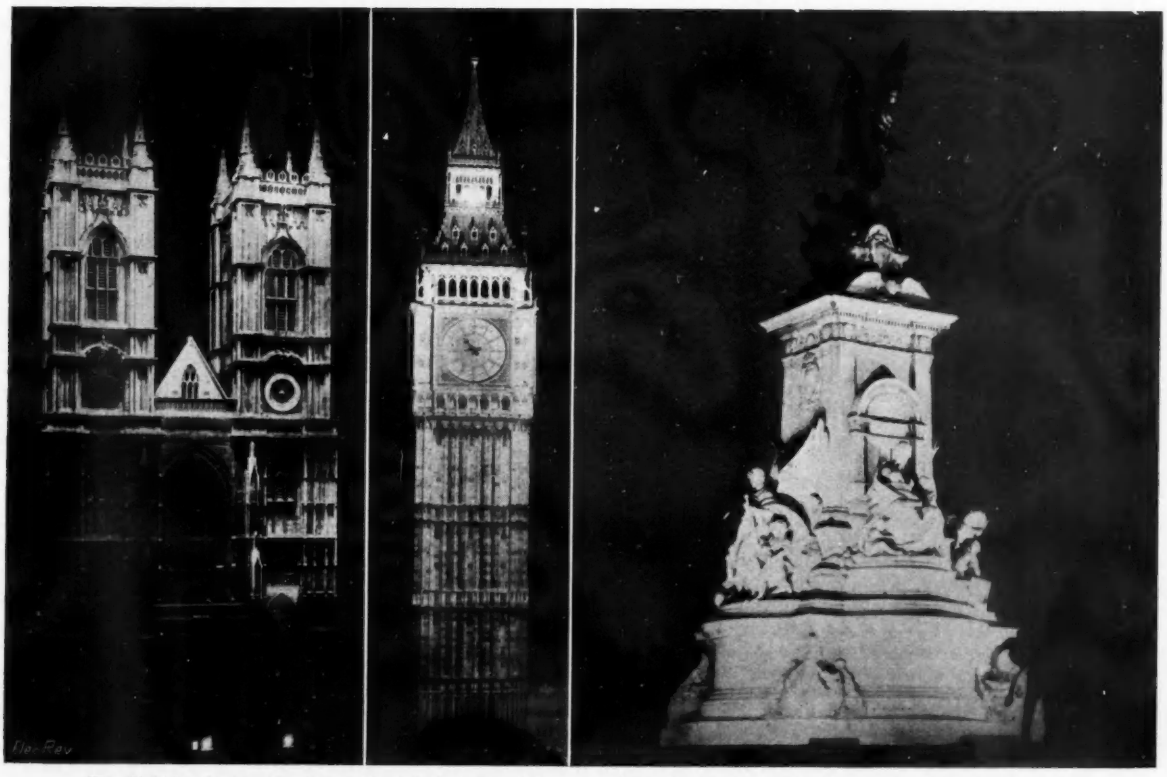
We reproduce below photographs taken during the period of the experiments which attracted a great deal of public attention and led to suggestions that permanent floodlighting might be applied to some of the leading buildings and monuments of the Metropolis.

The illumination of the west front of Westminster Abbey, seen in the left-hand illustration, was carried out jointly by Holophane, Ltd., and Siemens Electric Lamps and Supplies, Ltd., by means of a battery of twelve 1,000-W projectors mounted on the roof of the Central Hall, about 300 ft. away.

The same companies collaborated in the lighting of the western side of the Clock Tower of the Houses of Parliament (centre illustration). For this a similar installation was employed, the projectors being placed in the courtyard about 150 ft. from the base of the tower. It was necessary to install subsidiary 100-W reflectors to bring out the set-back belfry.

The General Electric Co., Ltd., was responsible for the third installation—at the Victoria Memorial in front of Buckingham Palace. For this a set of eight projectors was placed inside the low boundary wall of the monument. Various colour screens were tried in an endeavour to make the memorial stand out against the floodlighted front of the Palace.

The Edison Swan Electric Co., Ltd., is also taking part in the illuminations for the September Congress. It has been entrusted with the difficult task of floodlighting the Embankment façade of Somerset House, which is 600 ft. in length.



Floodlighting in London last week: Westminster Abbey, the Westminster Clock Tower, and the Victoria Memorial

Sidelines and Specialities. By H. R. Taunton

How a "second string" may prove valuable to electrical contractors

SIDELINES may be very useful "props" to an electrical contracting business, and, indeed, to the more ricketty an indispensable support. A recent article in an American trade paper, discussing the standing charges of a number of representative "electragists," quoted the case of one firm which, showing a loss on the year's trading, yet managed to convert it into a respectable profit, thanks to its total of cash discounts earned. Evidently, high finance was its sideline—or perhaps it was only its speciality. There is a distinction, though it is not always easy to define.

Almost every contracting firm makes a boast of at least one "speciality." The most modest letter heading will carry some such slogan as "Electric Bells a Speciality." Another firm, more audacious, will claim to be specialists in high-tension transmission or power station equipment, on the strength, it may be, of a single prehistoric contract. And again, the note-paper of a third firm will announce unblushingly that it "specialises" in a dozen different ways, covering almost every phase of a contractor's business. This is rather overworking the word.

Special Knowledge

A speciality—in the electrical contracting trade—is some particular branch of the normal business of electrical contracting to which the firm claiming it is presumed to have given special study, and for which it can show special qualifications of experience or resources.

While it would be manifestly absurd for a firm to claim a speciality in wiring—for it is the common basis of all electrical contractors' business—it could legitimately claim to specialise in theatre installation if it had successfully carried out a number of recent theatre or cinema contracts. Its claim to a speciality would then amount to an advertisement of the fact that its engineers and staff had had experience longer and wider than the normal, of the peculiar complications and difficulties of that class of work; and, as such, would carry weight with architects and consultants, and, perhaps, secure the firm a certain preference over competitors lacking the same experience. Similarly, other firms, on more or less solid grounds, may claim to be specialists in country-house plants, factory equipment or electric heating. In short, a speciality is any intensively cultivated patch of the wide field of electrical contracting.

Defining a Sideline

An electrical contractor's sideline, on the contrary, may be defined as some activity, more or less allied to the main business, but which is not essentially or necessarily electrical, and is not commonly undertaken by all contractors. The words 'more or less allied" are an important part of the definition. A man may advertise himself as an "Electrical Contractor and Fried Fish Merchant"—there are, up and down the country, combinations more fantastic than that—but the frying of fish cannot in any sense be considered as a sideline of electrical contracting. It is clearly a separate business, even if carried on by the same staff under the same roof.

There are, however, plenty of examples to be found of more legitimate sidelines. "Electrical Contractor and Hot Water Fitter" is a not uncommon one. Here the sideline is obviously allied to the main business. Like it, it is a business of contracts and jobbing in new and existing buildings, employing very similar material, labour, and tools. It can be run with the same office staff and the same organisation of stores and of accountants' and estimating departments. And, most important of all, establishing its legitimacy as a sideline to the main business, inquiries and orders follow easily and naturally from one to the other.

The same may be said of many other branches of the building trade: plumbing, ventilating, decorating, and the like. Electrical contracting is itself essentially a branch of the building trade, and it is an easy step from the securing of an order for it to the securing of an order for another branch, and *vice versâ*, since the antecedent opportunities are the same for both.

Complementary Businesses

Similar arguments apply, in a less degree, to such possible sidelines as architectural metal-work, fittings, office equipment, or even furniture. Indeed, it is not easy to draw a line and say what is or is not a sideline "more or less allied" to electrical contracting, for it is a trade which in its practice touches so many others. So long as the sideline helps, or is helped by, the main business, it may be considered a legitimate extension of it. One well-known firm runs a system of petrol-gas as a sideline to its electrical business. That is logical enough; for although in other hands it would be a competitive interest, it can, when run by an electrical firm, be put forward opportunely as an alternative to country-house lighting where the cost of an electrical plant proves prohibitive, or, again, as a useful adjunct for cooking and heating. Another firm, until recently, had a flourishing sideline in candles, a survival of the original business. Well, that again might by a stretch be considered a legitimate sideline, for after all it was only an extension of the main business, concerned primarily with illumination.

Wireless equipment naturally comes to mind as perhaps the commonest of sidelines. It is hardly that, but, as the contracting trade has claimed from the beginning, a natural branch of the business—and *not* of that of garage-keepers, drapers, and tobacconists. It may be a speciality, but it is ruled out as a sideline by the words of our definition: "not essentially or necessarily electrical." Radio apparatus is essentially and necessarily electrical and therefore as much in the province of electrical contracting as switches, lamps, or any other electrical material.

"Swings and Roundabouts"

Apart from the aid which a sideline gives to the main business by the mutual introduction of openings for inquiries and orders, it has the great advantage that it tends to equalise the pressure on the staff, particularly the indoor staff. It helps to flatten the turnover curve. An electrical contracting business pure and simple is apt to be affected by seasonal conditions. This is especially the case in the provinces, where there is not the steady crop of new buildings which helps the London firms to maintain a fair level of employment. But even there, the largest and most enterprising of firms strike at times a dull patch, when, inexplicably, their usual sources of inquiries dry up simultaneously, or a long series of tenders fail by narrow margins to become orders. They have to stand off good men, often long employed, with the risk of, perhaps, never regaining them; or even to cut down their indoor staff.

It is then that the value of a sideline may be most appreciated. If it is, say, ventilating, its seasonal variations will probably differ from those of electrical contracting; or it may be a line which is largely independent of the time of the year. Apart from that, it is common for one trade to be depressed for temporary reasons while another is booming. The chances of both the main business and the sideline being depressed simultaneously are obviously reduced, if they are of sufficiently different characters; and, provided always that they are not so widely different that they cannot be carried on by the same staff, the chances of maintaining a steady total turnover and average of employment are proportionately improved.

Sidelines and the Future

And, finally, to argue with the pessimists, there is the point that what is now a sideline may ultimately prove to be the surviving mainstay of an electrical contracting business. There are those who maintain that such factors as the coming of the grid and the increasing activities of corporations and supply companies spell the inevitable extinction of small contracting businesses. If those have been successful in the meantime in developing a sound sideline which is independent of such factors, the day may well come when they will thankfully turn to it, take it as their main business, and dub what little is left to them in the way of electrical work—a mere "sideline"!

Victorian Wiring Regulations.

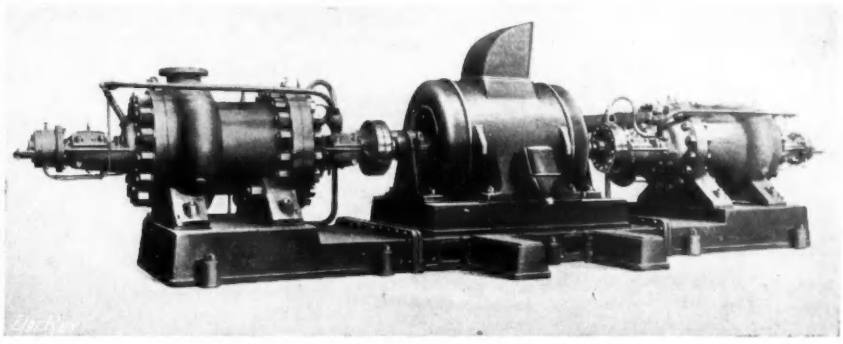
The Electrical Engineer of Australia and New Zealand says that the Victorian Electricity Commission, which draws up and administers wiring regulations for that State, has brought out several amendments designed to make matters easier, and is now co-operating with the Standards Association of Australia in the preparation of an entirely new wiring code. An amendment to regulation No. 1 of the Commission's rules, instituted in 1929, provides that consumers' mains shall be not smaller than 7/.036. This is principally to provide for future increases in domestic load, reasonable provision for these being made up to the consumers' switchboard. An amendment to regulation No. 9, brought out in the same year, provides for increase in domestic load to a total exceeding 15 A per phase without compulsory balancing, unless the supply authority deems balancing necessary for reasons of efficient operation and pressure regulation. Amendments to regulations 71 and 75, dated February, 1931, insist on 1,000-W power plugs and their controlling switches being of sufficient current capacity to ensure safe operation with the usual types of domestic heaters.

In the new code, provision is made for the rating of circuits by their total loading as the primary factor, rather than by the number of points. This will permit of mixed lighting and heating circuits where economical. The section of this code dealing with heating appliances also lays down certain minimum requirements considered necessary to provide safe and satisfactory operation.

Power Pumping in Mines. By F. J. Garland, M.I.W.E.

Featuring installations abroad designed for difficult and special conditions

FOR underground work the electrically-driven pump is of the turbine or the reciprocating type, the former being generally cheaper, but the latter is probably the more efficient over a long period and a wide range of head. It will also handle gritty water and start without priming and without a foot valve. Within the limits usually available below ground, the electrically-driven, multi-stage, centrifugal pump possesses qualities which specially fit it for drainage work, and it has been found that on the Rand, particularly due to the prevailing high lifts and the corrosive nature of the water, conditions which call for high skill in design and construction, installations of this type have satisfactorily fulfilled the onerous conditions demanded of them. A recent installation comprises two units, each for an output of 42,000 g.p.h. against 2,840 ft., 1,470 r.p.m. Each unit has a low- and a high-pressure section on either side of the driving motor, the low section delivering in series with the high through inter-connecting pipes. The pump castings are of cast-steel with bronze protecting levers, and the stage sections are contained within these steel castings. Each unit has 16 stages, 8 in either side of the motor, the water passage throughout being lined with special bronze; the pump shafts carrying the bronze impellers are covered with heavy bronze sleeves. Precaution is taken to prevent water coming in contact with the shaft. In these types end thrust balancing is very important. Hydraulic balance disks are provided, automatic in action, the device being mounted at the outer end of each section of the pump where it is accessible for disk-face or sealing-ring renewal when necessary. The units are mounted on a cast-iron baseplate with extension pieces to allow the motor to be drawn out between the two sections. The motors are 50-cycle, 3-phase, 1,200-b.h.p. machines, occupying only about 30 ft. by 8 ft. Similar sets are in operation at New Moddersfontein Mines in South Africa.



Multi-stage Centrifugal Pumping Set at Moddersfontein

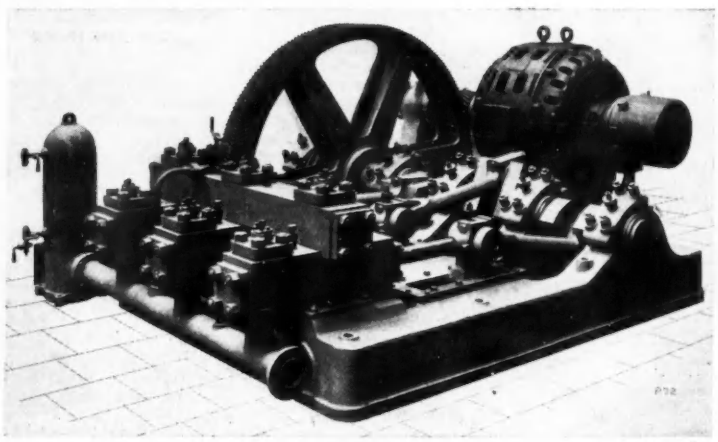
A method of mine pumping is where the electric pumps are placed on different levels, the delivery pipe of each pump being connected direct to the suction inlet of the next higher pump and where no intermediate tanks are necessary or where mine pumps are both on one level. Pumps of this kind have been operating efficiently, notably in Spain.

The five-bearing type of ram pump is a powerful unit for heavy mine work, being made with double reduction gear, an interchangeable ram case and clack boxes. Avoidance of shock is secured by a spring alleviator or air vessels, and to ensure silent action the motor pinion can be supplied of compressed paper. These provisions, coupled with the three-throw action, all contribute to steady running and efficiency. The pumps are simply and substantially built and easily accessible for repair, a distinct asset in a foreign land where engineering shops are few and far between.

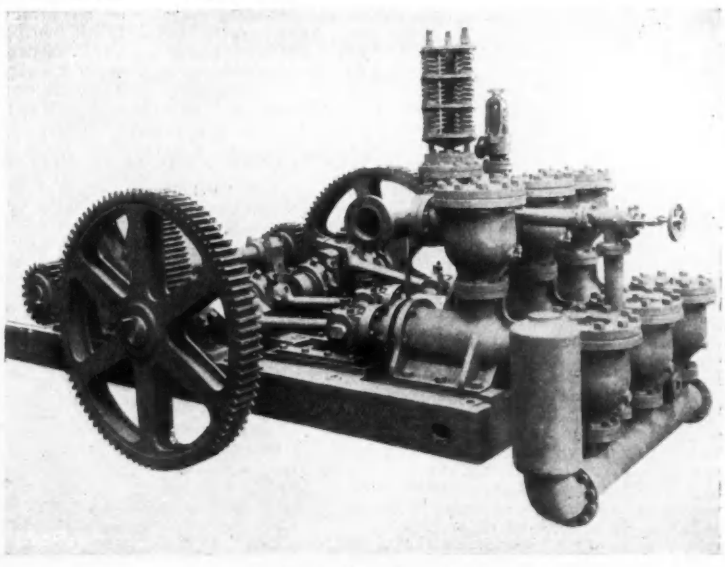
For sinking and unwatering of flooded shafts and for development work the motor-driven centrifugal pump is eminently adaptable and efficient. The pump is usually supported on a steel frame carried by a flexible wire rope, the delivery being taken up centrally between the two parts of the wire rope. The whole self-contained unit can be raised or lowered by a surface winch. The electric cable can be secured to the wire rope and pipe by cleats, and it can be so constructed that the weight of the moving part is carried by the pressure of the water. Until the pump actually begins to deliver, these moving parts are supported by a thrust bearing with a coupling, so that no vertical thrust ensues between the motor and the pump. The utility of these sinking sets has been demonstrated in conjunction with permanent sets. The sinking pump operates in advance, and then after the permanent set has been installed it is again advanced, and so on, until the final depth has been reached, when the permanent pump is fixed for good. The following results were obtained from recent tests. A three-throw pump lifting against 1,200 ft. and driven by a 320-h.p. motor gave 92.85 per cent. efficiency, and another for 1,880 ft. 94.7 per cent. efficiency; after a year's run a third gave 93 per cent. The following have also been obtained against various heads:—

400 to 600 ft.	...	85/96 per cent. efficiency.
600 to 1,000 ft.	...	88/90 ,, ,,
Up to 1,806 ft.	...	90/92 ,, ,,

Tests seem to show that as the lift increases in the case of the multi-stage centrifugal pump the efficiency tends to decline somewhat, and in some cases it has not exceeded about 40 to 50 per cent., except where the plant was new and in very good condition. The usual practice in all reputed engineering works to-day is properly to test all pump work before leaving the works, and for mine motor-driven units special test plant has been installed. At one works I know of, all centrifugal pumps are tested through venturi meters and against a tank of 50,000 gallons capacity, each up to 30,000 g.p.m., driven by a special test motor.



Five-bearing Treble Ram Pump

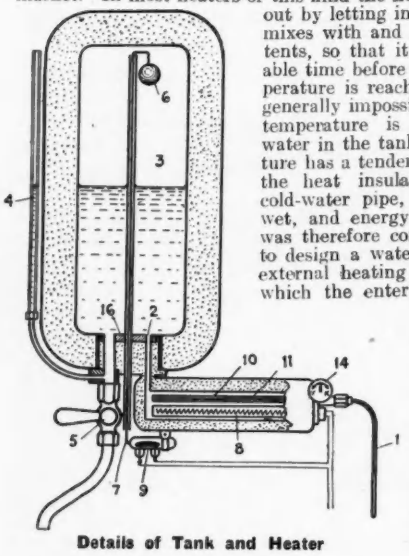


A Modern Mine Ram Pump

Novel Water Heater. By A. Ekstrom, D.Sc., M.I.E.E., and V. Ekstrom

An external heating unit and a saving of 20 per cent. in current consumption

ONE interesting result of the praiseworthy research work carried out by the Electrothermic Institute of the Royal Academy of Technic and Science in Stockholm, under its leader Mr. Otto Stalhane, is the construction of a new electric water heater which has recently been put on the market. In most heaters of this kind the hot water is pressed out by letting in cold water which mixes with and cools the hot contents, so that it takes a considerable time before the ultimate temperature is reached. In fact it is generally impossible to know what temperature is reached by the water in the tank. Further, moisture has a tendency to condense in the heat insulation around the cold-water pipe, the lagging gets wet, and energy losses result. It was therefore considered desirable to design a water heater with an external heating element through which the entering water should slowly pass, so that it would be heated to a desired temperature before it entered the tank. It has been found that with such a design the thermal insulation of the tank can easily be made sufficiently good to keep the water hot for a couple of days, and that water drawn from the tank always has the right temperature. A glass tube shows how much water there is left, and the inlet automatically opens as soon as the level sinks below a certain top-mark. Hot water will then trickle into the tank until it is full and will be automatically regulated to have the right temperature whatever its original temperature may have been.

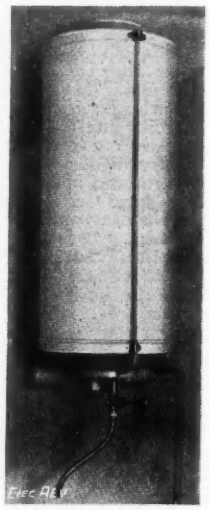


Details of Tank and Heater

Referring to the drawings, the cold water enters through the pipe 1, which need only be of very small diameter as the water passes through it slowly, from which it passes through the flow-through heater before it enters the tank 3 at 2. The water in the tank thus rises gradually, its level being shown by the glass gauge 4. In order to withdraw warm water from the tank a tap 5 with a moveable extension at the bottom is used.

When the water reaches the upper part of the tank it lifts the float 6, rigidly connected to a metal rod 7, the lower end of which operates a mercury switch so as to disconnect the electricity supply. The flow-through device is then gradually filled with cold water and the brass tube 10 becomes shorter by contraction, presses the rod 11 against the phosphor-bronze ball 12, which consequently closes the inlet for the cold water. The rod 11 is made of invar, a metal with a very small coefficient of expansion.

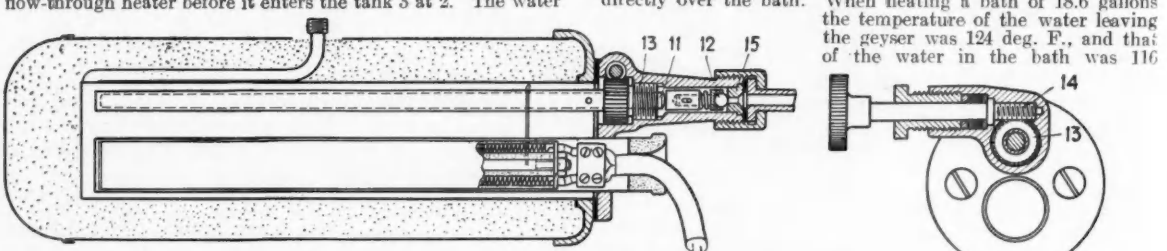
When warm water is withdrawn the water level and the float sink, and the mercury switch is closed. The water in the flow-through heater is thus heated, the brass tube 10 expands and the ball 12 gradually opens the inlet for the cold-water supply. The right end of the tube 10 is soldered to a nut 13. The tube can be placed at a suitable distance from the valve seat of the ball, by operation of the screw wheel. The speed at which the cold water enters the flow-through heater and consequently the temperature of the warm water entering the tank can thus be controlled. As a result of the alteration in length of the brass tube, the valve acts as an automatic temperature regulator. All the tubes and other arrangements are fixed to a common plate 16 screwed down, with a lining, to the bottom of the tank. The tank, with its insulating walls, therefore represents one unit, while the flow-through device with all its details is an entirely independent construction. The loading of the heater is from 200 to 300 W. For the pipe connecting the tank to the cold-water supply for washrooms and kitchens a thin soft copper tube can be used, the fixing of which is very simple. If it is desired that the hot water should leave the tank at a higher pressure, *e.g.*, for a shower bath, a special mixing tap and an ejector connected to the cold-water supply is installed. In this case the pipe connecting the tank to the cold-water supply must be larger and more substantial.



The New Heater

The manufacturing cost of this new water heater, the inventors of which are Mr. Stalhane and Mr. Hilding Svenson, are about the same as heaters at present in use, and tests have shown a saving in electricity consumption of about 20 per cent., as compared with the ordinary constructions.

A gas geyser was recently installed in a bathroom in London, directly over the bath. When heating a bath of 18.6 gallons the temperature of the water leaving the geyser was 124 deg. F., and that of the water in the bath was 116 deg. F. The temperature of the water before heating was 41 deg. F. The gas, measured by a meter inserted just in front of the entrance of the pipe into the geyser and especially tested for this purpose, was 43.4 cu. ft. At a price of 3s. 7d. per 1,000 cu. ft. of gas the cost of such a bath would be 1.9d. The consumption of electricity for a similar bath, assuming an efficiency of 80 per cent. for a storage heater, would be 5.1 kWh. The competitive price for electricity is thus about 0.4d. per kWh.



Constructional Details of External Flow-through Heater Unit

Electrical Artisans in France

ABOUT a year ago the French Union des Syndicats de l'Electricité instructed its Technical Education Committee to inquire into the development of technical education of young men who intend to become proficient in the work of fitting and maintaining electric light and power installations. The Committee has recently reported that the object to be aimed at is that the instruction to be provided shall result in the supply of a sufficient number of electrical installation men who thoroughly know their work. In drawing up a curriculum it has been borne in mind that students must have a solid groundwork in elementary instruction.

Students will be trained to a trade at which they can earn their living and still be free to attend classes in other subjects according to their individual requirements and preferences. The projected course will last two years and, if he passes the examination at the end, the student will be given a diploma as an "ouvrier monteur installateur electricien" (electrical wiring and installing workman). If necessary, the student may continue for a third year, the passing of the examination of which will entitle him to add the word "qualified" to the above-mentioned trade title; while a further extension will be provided for those desiring to become foremen.

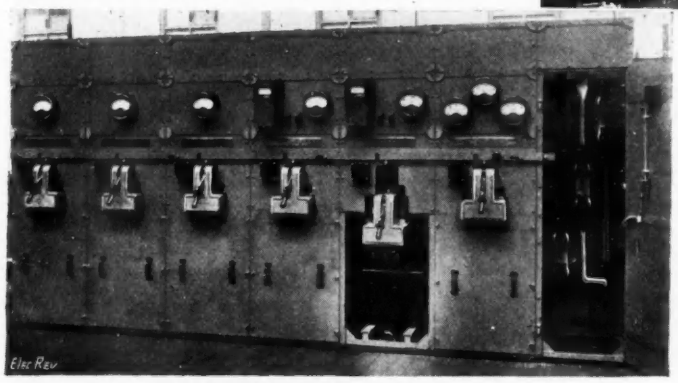
As it is intended to establish classes in all the leading industrial centres of France, and in order that contractors may rely on obtaining workmen who have all undergone the same necessary training, the curriculum and the diplomas have been drawn up by the Union in conjunction with the Technical Education Division of the French Ministry of Public Instruction. With the object of carrying the scheme into effect an Association is being formed for (1) the establishment of courses of instruction, each with its own financial autonomy, and to determine the industrial centres in which such courses shall be established; (2) to develop and extend existing courses of instruction; (3) to fix the character of the instruction to be given and to draw up programmes for the courses; (4) to supervise the continuity and uniformity of the various courses at the different centres; and (5) to assist morally and, if necessary materially, the different courses. The necessary financial resources of the Association are to be provided by its members and supporters, donations being also invited from interested persons. Already the new Association has secured the patronage and support of the five principal associations and societies connected with the electrical engineering industries in France as well as the Ministry of Public Instruction.

Switchgear Developments

Impressions of a visit to a north-country factory

DURING a recent visit to the works at Manchester of Erskine, Heap & Co., Ltd., our representative was interested to note that they had lately built a new erection shop and test room, affording greatly increased floor space for the erection of main switch boards and large switchgear units. In this section were seen many high- and low-pressure switchboards and starting gear for both municipal and industrial concerns at home and for export. The opportunity to examine the company's latest type of drop-down switchgear was welcomed, this being a development of the earliest

The New Erection Shop



Switchboard with 75,000-kVA Drop Gear

vertical draw-out type of switchgear, of which Erskine Heap were the original patentees. A description of this class of gear was given in the ELECTRICAL REVIEW, March 22nd, 1929, and a reference to the earliest design was given in the letter of A. Reyrolle & Co., Ltd., in the same journal of March 20th, 1931.

New Mining Switchgear

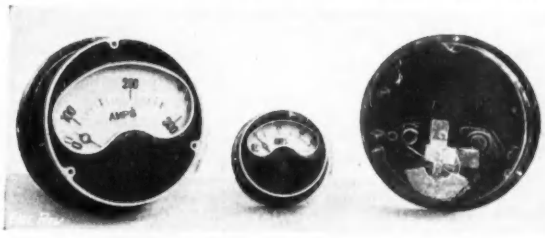
A new type of flameproof mining switchgear which has recently been placed on the market by this company is of a practical and robust design, complying fully with the most recent official regulations and suggestions, particularly those outlined in pamphlet MD, Circ. No. 23, issued by the Mines Department. The interlocking arrangements are very complete, it being impossible to remove the tank, switch cover or isolating cover until the switch and isolating gear have been brought to the "off" position. The interlock mechanism also prevents the isolating switch being operated unless all covers, &c., are in a position of safety. The switch is complete with earthing contacts which form part of the actual oil-switch unit, thus obviating the necessity of separate plugs when earthing conditions are required. The earthing arrangements prevent accidental earth contact being made unless conditions are suitable for the earth contacts to be closed, and once they have been closed they can be locked in position to prevent interference by unauthorised persons.

The busbar chamber is provided with separate compartments which can be compounded and through which the busbars pass, the bars being bushed in such a manner as to prevent the possibility of outside gases being fired in the event of the end plate of the busbar chamber being omitted by a careless workman. The trifurcating box is so designed as to avoid the necessity of compound being removed from the chamber in the event of an alteration to the cabling being necessary, or the switch requiring to be transferred to a new position, as frequently occurs in mining work. The apparatus is designed on the unit principle, so that terminal switches, straight-through switches, starting gear, &c., can be built up in the form of a switchboard if so desired. It is made in two standard current-carrying capacities and for voltages of 600 and 3,300.

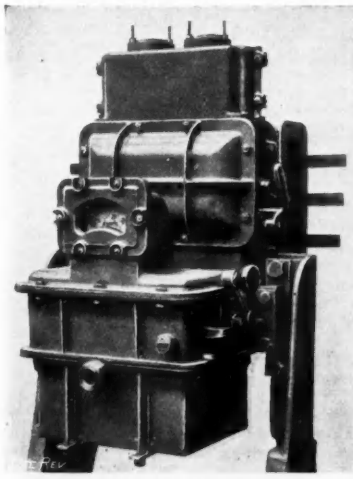
Another recent development of the company is its standard air-break starter, to which has been added isolating features mounted immediately above the starter case. They are suitably shrouded to prevent accidental contact when the starter is isolated, and when the lid is open the interior of the starter is completely "dead."

Moving-iron Instruments

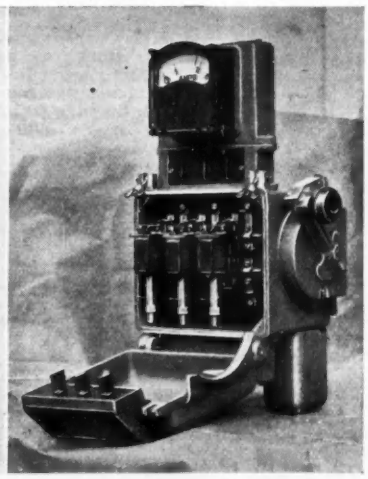
The company is also at present specialising in its new moving-iron ammeter and voltmeter. The instrument has a very evenly divided scale which is very readily seen from a distance. The movement is very light but strong, and, due to the special arrangement of the dashpot, is almost theoretically "deadbeat." As the instrument has been designed primarily for use on fluctuating loads this feature is a very important one, and, in addition to this, the movement will withstand short-circuit conditions of more than ten times the maximum scale reading without damage to the instrument—a valuable asset for motor starting. The volume of iron in the movement has been reduced to the absolute minimum, and consequently hysteresis errors and errors due to varying periodicity are practically non-existent. As a matter of fact, the instrument can be used on either a.c. up to approximately 100 cycles and on d.c. without any real difference. All the above instruments are of the spring controlled pattern, this type having considerable advantages over those with gravity control. The excellent appearance of the meters is ensured by the spraying with cellulose paint with which these instruments, together with all the equipment of the company's manufacture, are painted. This instrument is made in models with 2½ in., 4-in., 6-in., and 8-in. scales.



Six- and 2½-in. Ammeters; Internal Construction



New Flameproof Mining Switch



Air-break Starter with Isolator

Some of the most interesting contracts carried out recently by this firm are the main switchgear for the new Liverpool abattoirs; the main switchboards for the new Masonic Peace Memorial Hall in London; the main switchgear for the new British Broadcasting House in Langham Place, London; and the switchgear in the power station of the Mersey Docks and Harbour Board for the modernisation of the central docks electricity supply.

The factory is well laid out for modern methods of mass production, although in its present form it is the result of the many extensions which the progressive output during the long existence of the company has necessitated.

The Household Radio Receiver. By L. S. Crutch, B.Sc.(Eng.)

From the point of view of the electrical engineer unconnected with the wireless trade, what is the ideal domestic installation?

WHAT kind of a set shall I buy? Such a question is impossible to answer in a few words. The intending set-owner to-day should consider the matter as an installation and give it every bit as much consideration as he would to the purchase of a new motor-car, or to the electrical arrangements of houses to be connected to the public electricity supply mains.

Aerials

The aerial is usually the first thing to be considered, since on the decision rests the choice of the receiver itself. An outdoor aerial is ugly, but it is a very valuable factor in providing good reception with simple and inexpensive apparatus. Very large and high aerials are quite unnecessary; small well-erected ones may be quite efficient, neat, and unobtrusive. Frame aerials, and those contained in the receiver itself, make the use of a more elaborate and sensitive receiver essential, if anything beyond reception of the local station is desired. Such a receiver, if well designed, need be no more difficult to handle than the simpler variety, but it is necessarily more expensive. Whatever the type of receiver used, the most satisfactory aerial seems to be 50 ft. of wire erected out of doors at a height of 20 ft., as far away as possible from trees and large metal objects. The importance of a short and well insulated lead-in from the aerial to the receiver and a similar short lead to a buried "earth" of some non-perishing material, such as copper, cannot be overstressed.

Energy Supply

This may be provided by batteries or by the domestic mains. The capital cost of the equipment for mains energisation is greater than the first outlay on batteries, but the difference in maintenance costs is so great that the mains equipment usually pays for itself within twelve months, after which the maintenance cost of the receiver falls to a very low figure. On direct-current mains "commutator ripple" troubles can usually be overcome without much difficulty, but there is no difficulty whatever in connecting the highest grade of receiver to a.c. mains and obtaining reception free from hum and background noise. Certain regulations have been laid down as part of the I.E.E. Wiring Rules, relating to the connection of radio receivers to the public mains, mostly for the safety to the user. One rule should be particularly stressed: that relating to the earthing of the mains through receivers connected to them. On a.c. systems the use of a double-wound transformer is specified, and earthing can then only take place in the event of a breakdown of the transformer. The earthing of d.c. mains is another matter; condensers of capacity not less than 1/10 microfarad and capable of withstanding at least twice the mains pressure, should always be inserted between the set and the aerial and earth connections.

Situation of the Receiver

If used with an outside aerial, the receiver should be in the room where listening will mostly be done. The convenience of battery-operated portable sets is, in the writer's opinion, dearly bought at the expense of quality of reproduction and available volume.

Extension leads from the set to the loud-speaker should be of twin wire and lead covered, the sheath being earthed to the terminal of the receiver. These leads should always be as short as possible and connected to sockets at suitable points. Such work is best done by a wiring contractor, particularly if other wiring is being done at the same time. The route of the extension leads should not, however, be alongside the supply leads, but as remote from them as possible.

Operation

A set having numerous controls may give excellent results when handled by an "expert," but will bewilder the ordinary domestic user. The ideal set would have a single "on-off" switch, singe-dial tuning and control of volume. Calibration is a matter for discussion. The ordinary angular graduation of the dial has much to recommend it, for direct calibration in wavelengths is rather difficult from the manufacturer's point of view, particularly when external aerials are used, but it is certainly an advantage when attempting to receive distant stations of known wave-lengths. The tuning dial should always be properly illuminated; if not by ordinary room lighting, then by a pilot lamp mounted on the set. Selectivity is an essential feature, but if overdone quality of reproduction suffers and tuning becomes too difficult to be easily undertaken by the ordinary listener. Selectivity which is obtained by the critical use of reaction, or couplings, such that stations are only audible over about one degree of the tuning dial, is quite useless for domestic receivers. Remote control has not received much attention as yet.

Loud-speakers

On the choice of type and associated low-frequency amplifying apparatus it is very difficult to state any very definite ideas. Upkeep cost, so far as the anode battery is concerned, is governed almost entirely by the volume required from the set. In the case of a mains-driven set, the first cost of the apparatus is largely determined by the same consideration, but maintenance is so small that moderate volume available when required, although not always fully used, is usually productive of better quality than operation at maximum volume. The moving-coil loud-speaker has certain inherent advantages, but is not usually worth the expense if only "small room" volume is required. The disadvantage of the energy required to excite the field coil has been overcome by the introduction of a new type in which the flux is produced by permanent magnets. A moving-coil speaker is always preferable for gramophone reproduction and will also do full justice to good-quality transmission and a well-designed receiver. It should not, however, be considered a *sine quâ non*, as there are a great many cone speakers which give very pleasing reproduction at medium strength with quite simple apparatus. Whenever a loud-speaker is used on extension lines in a house, a low-impedance instrument should be used in conjunction with a suitable output transformer in the receiver. In appearance a loud-speaker should be unobtrusive and its position in the room should be at about the same level above the floor as that of the performers in the studio. It should not be placed so that unpleasant echoes can arise and, if structural alterations are easy, an ideal situation is let into the wall midway between the floor and the ceiling, the cone fitting flush with the wall surface and disguised by a gauze cover representing a picture.

The Overseas Listener

The requirements of colonial and overseas listeners should not be overlooked, for in many situations direct reception is only possible, atmospherics permitting, with very sensitive apparatus, say of the "superheterodyne" type. As an alternative, short-wave transmission has an almost world-wide range and can be picked up easily on a simple receiver suitably adapted and used with a small outside aerial. A moving-coil loud-speaker and elaborate high-quality amplifiers will not in general be justifiable with a set of this kind.

The Ideal Receiver

This would virtualy comprise two sets, three pieces of furniture, a somewhat ambitious installation. It would have its own self-contained aerial inside the cabinet, which would be the size of a cabinet gramophone and capable of being wheeled about on castors. Only intended for the reception of the local programmes, the set would be very simple to operate and might even have preset tuning, so that stations would be obtained merely by turning the appropriate switch. It would have a high-quality amplifier capable of driving a moving-coil loud speaker (enough volume to fill a large living room) in a separate cabinet, also capable of being wheeled about from room to room. Extension leads would be provided from the room in which the receiver was to be normally used to other rooms, so that it would not always be necessary to move the receiver and more than one loud-speaker might be used at a time in different rooms. The third unit would be a "superheterodyne" receiver constructed to fit into a medium-sized suitcase and having a frame aerial in the lid. It would have no low-frequency amplifier, its output being plugged into the amplifier of the main receiver and it would of course use the same loud-speaker. Provision would be made for the use of headphones with the portable unit to tune in distant stations for reproduction by the loud-speaker. Furthermore, this equipment would include a turntable, motor, and an electric pick-up for reproducing gramophone records. It would be entirely mains driven, otherwise it must be admitted that such an installation would not be really a practical economical proposition.

Conclusion

The foregoing remarks indicate the need for careful consideration before the installation of wireless receiving apparatus, and emphasise the fact that there is much scope for installation contracting work of this nature by those having a thorough understanding of the principles involved.

Interference

The interference of railless electric omnibuses and tramways with broadcast radio-telephony reception, which is considerable in some localities and is not by any means confined to this country, has prompted the Technical Council of the Radio Association to offer a gold medal for the best constructive paper on the subject.

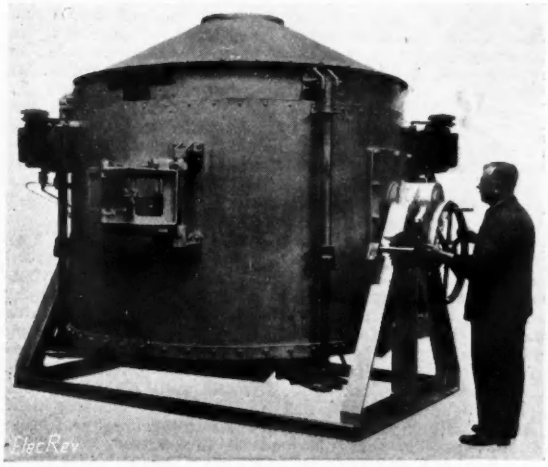
The competition is open to all radio engineers in England and, while major attention should be paid to technical submissions, it is desirable to deal also with administration with the object of determining the division of responsibility between the Post Office and the British Broadcasting Corporation, both of which are investigating the matter in co-operation with traction authorities, relative to the tracing and elimination of such interference.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Furnaces for Non-Ferrous Metals

In a range of electric furnaces introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, for melting aluminium and its alloys, brass, copper, gold, silver, &c., the melting losses are very small and alloys can be produced precisely to analysis. The melting conditions are



"Magnet" 60-kW Annealing and Normalising Furnace

ideal as regards temperature, atmosphere control, and accessibility of the bath for cleaning purposes, and the metal produced has every quality of crucible metal with added advantages such as freedom from occluded gases, precision of temperature control, and the ability to work closely to specification. Further, labour requirements and costs are reduced appreciably. The accompanying illustration is of a 60-kW box-type furnace having a hearth area of 5 ft. 6 in. by 3 ft. 7 in., and an internal height of 1 ft. 10 in. It is used for the annealing and normalising of brass and copper stampings. A multi-car type furnace of 150-kW capacity has a total hearth area of 24 ft. by 7 ft. 5 in. and is used for the precise annealing of aluminium sheets which are placed on cars, four of which are in the furnace at one time. The heating elements are mounted on the side walls and the roof of the furnace, and are placed in channels in the car hearths. Those situated in the hearths each constitute a separate self-contained circuit, and running contacts are employed instead of the more customary trailing cables. Important features are that the whole furnace is effectively sand-sealed and radiation losses are reduced to a minimum.

Very Low C.P. Lamp

The "Nivex" pilot lamp has lately been introduced by RUNBAKEN MAGNETO CO., LTD., Tipping Street, Ardwick, Manchester, for use where only a very little light is required, such as in corridors, nurseries, &c. It fits into any ordinary lampholder and incorporates a small self-contained auto-transformer by which the lighting voltage is reduced to 3.5. The bulb is easily replaced. Economy in consumption is, of course, a big recommendation for such apparatus.

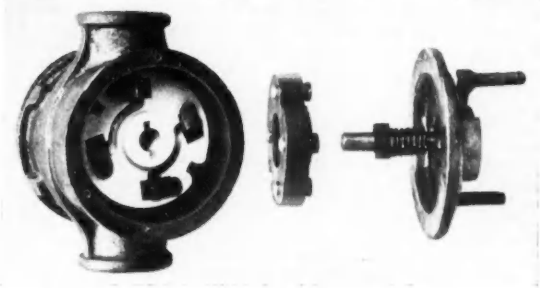
"Nivex" Pilot Lamp

Small Recording Instruments

Some new types of small recording instruments introduced by the ANGLO-SWISS ELECTRICAL CO., LTD., Victoria Street, London, S.W.1, are made up as switchboard and portable instruments and cover a wide range of types. The movement of the a.c. instruments such as recording power-factor meters, frequency meters, and wattmeters is of the ferro-dynamic type and maintains accuracy even with considerable variations of voltage or frequency. The recording is effected by means of a carefully-supported capillary pen slung under the end of the pointer arm. The rear end of this pen dips into an ink trough, one filling of which will last approximately one month. The movement of the pointer is parallel to the scale, thus enabling straight hour lines to be used on the chart. The chart is 7 cm. wide and 15 metres long, which, assuming a chart speed of 2 cm. per hour, will last for approximately four weeks. The chart is so arranged as to leave a long section of it visible. The drum over which the paper passes is driven by an eight-day clock movement, and is provided with pegs at each end which engage into perforations in the paper. These, combined with guides, ensure a uniform motion of the chart without the risk of buckling. The whole chart mechanism, including the clock, swings forward and can be removed *en bloc*, thus facilitating the changing of charts. The movement is mounted on a cast-iron base plate and is housed in either a flush or a projected mounting case. The portable instrument weighs approximately 22 lb. and is housed in a robust oak case, the dimensions of which are 11¾ by 9 by 6¾ in. The instruments are manufactured by Messrs. Trüb, Täuber & Co., Zürich, Switzerland.

Street Lighting D.P. Switch and Fuse

A new switch and fuse of the semi-rotary type for the control of outside lighting fittings has been produced by REVO ELECTRIC CO., LTD., Britannia Works, Tividale, Tipton, Staffordshire. Its outside appearance differs little from the older models made by the company, but the internal mechanism has been entirely re-designed to provide a switch of simple construction and efficient action. The moving component carrying the contacts and incorporating the d.p. fuses is made of moulded material capable of withstanding considerable shock without fracture. It is mounted on a rotating and sliding spindle provided externally with a handle suitable for pole or lever operation. The spindle is provided with a transverse pin protruding at each extremity which is disposed on the inside of the cover plate. The pin co-operates with dual cam faces on the inside of the lid and is normally urged from the cam centre along one or other of the faces by means of a helical spring surrounding the spindle and bearing on the pin at one end and the semi-rotary component at the other. Connection is made between the spindle and contact carrier by keys on the spindle and keyways in the semi-rotary component. Upon the handle being moved from one position to another the spindle pin is carried from one cam face to the adjacent one, and by virtue of its passing over the cam peak

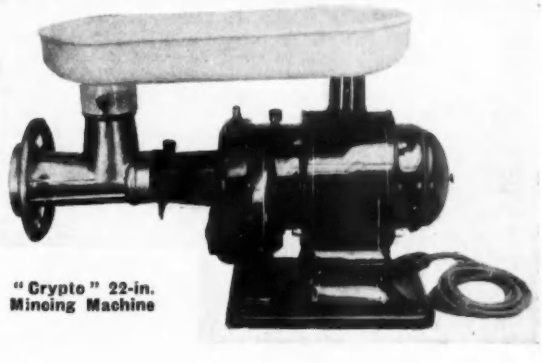


Components of "Revo" Outdoor Lighting Switch

under the influence of the spring a quick movement is imparted to the movable component in each direction, giving a quick make and break of the contacts. Abrupt shoulders, opposite the cam faces, form stops positively to limit the movement and prevent any damage resulting from forcing the switch. Phosphor-bronze spring contacts are provided upon the fixed members to which easy access for wiring purposes is provided by removing a lid. This member is made of glazed porcelain and secured to the outer substantial cylindrical casing by diametrically placed slots. The unit is of robust construction and of ample proportions to carry its rated load of 10 A.

Self-contained Mincing Machine

The illustration shows what is likely to be a promising line introduced by the CRYPTO ELECTRICAL CO., LTD., Acton Lane, Willesden, N.W.10—a 22-in. electrically driven mincing machine with an output capacity of 300 lb. per hour. The driving element incorporates a ½-h.p. repulsion-start induction motor, 1,440 r.p.m., operating through enclosed gearing which reduces the speed to 150 r.p.m.



"Crypto" 22-in. Mincing Machine

School and Library Lighting

Minimum values of illumination which are an indication of good modern practice

TWO valuable reports* on the above subjects have been issued by the Illuminating Engineering Society, being the joint work of representatives of the leading professional bodies interested.

No results of scientific research into the relation between school lighting and the well-being, or performance of work, of the pupils, such as would form a basis for standards and regulations, appears to have been published. A comprehensive inquiry of this nature has been initiated, but, pending its conclusion, recommendations based on general experience and on observations of what is considered to be good up-to-date practice should be of utility, especially as a guide to the lighting of new schools. The following series of specifications have been prepared solely on this basis.

School Illumination

Natural lighting recommendations are confined to the provision of adequate penetration of daylight into classrooms, apart from sunlight penetration, which is being studied separately.

The minimum artificial illumination provided should be:

(i) In schoolrooms, measured on the desk, table, or other surface on which the work is done, (*a*) 5 foot-candles† for ordinary clerical work (reading and writing) and (*b*) 8 foot-candles for special work (in art classes, drawing offices, workshops, and sewing rooms where dark materials may be used).

(ii) On blackboards, measured on the plane of the board, 60 per cent. in excess of the illumination measured on desks.

(iii) In assembly rooms and recreation rooms 3 foot-candles measured in a horizontal plane 2 ft. 9 in. above the floor level.

(iv) General illumination, apart from the minimum values recommended above, in no part of any school building should be less than 1 foot-candle (measured, in the case of stairways, upon the tread surface and in other places measured on a horizontal plane 2 ft. 9 in. above the floor level).

With a view to avoiding direct glare it is recommended that (i) no incandescent surface, or brightly illuminated reflector, or similar surfaces forming part of lighting fittings, should be visible to the eyes of teacher or pupils while carrying on their ordinary work, and sources of light should preferably be surrounded by a diffusing medium such that its average brightness does not exceed 5 candles per sq. in. of surface area. (ii) No source of light should be below a line drawn from a point on the back wall 3 ft. 6 in. above the floor to a point 4 ft. above the upper edge of the blackboard surface, unless it is completely screened from the eyes of pupils by an opaque screen. In the case of a room having a sloping or stepped floor rising away from the blackboard, the 3 ft. 6 in. is to be measured from the elevated floor surface at the end of the room remote from the blackboard.

Special care should be devoted to the selection of blackboards, the surfaces of walls, ceilings, and furniture, which should be of such a surface texture that any considerable specular reflection is avoided (glazed and shiny surfaces above the dado are specially objectionable). The use of highly glazed paper and books should also be avoided.

Lamp Positions and Shadows

The number and positions of lights should be so chosen that objectionable shadows cast by the body and structural features of the room on places where work is done are avoided; shadows are least evident when the sources of light are surrounded by diffusing media. The ceilings should preferably be white and the walls and all decoration above the dado should be light in tint.

Classrooms approximately of the standard size (*i.e.*, about 480 sq. ft.) may conveniently be lighted efficiently by four suitable units distributed symmetrically above the desks, but supplementary illumination for the teacher's area and the blackboard by two additional units is sometimes desirable. With a view to avoiding glare it is important that the lights be kept well out of the normal line of vision. Where practicable, a height of suspension of not less than 10 ft. is to be desired. Special importance attaches to supplementary lamps intended to illuminate the blackboard or the teacher's area, as these are more liable to come within the direct view of pupils, and because incorrect location is liable to give rise to troublesome reflected light from the blackboard surface. For these reasons it is desirable to make the height of suspension of such additional sources as great as possible, and to pay special attention to screening. On stairways light sources should be so placed that each flight of stairs is illuminated both from above and from below.

It is expedient that all lamps and fittings should be overhauled and cleaned at intervals of not more than one month. For general lighting modern enclosed fittings, which are less liable to suffer from the entrance of dust, are to be preferred.

Library Lighting

The recommended minimum illumination at table height for reading purposes is 5 foot-candles, which may be obtained by general lighting alone, or by a combination of general and supplementary local lighting. When reading-lamps furnishing supplementary local lighting are employed the minimum value of the general illumination measured at table height throughout the room should be 1 foot-candle, additional to the illumination furnished by reading-lamps.

If the reading illumination is furnished by overhead general-lighting units, some care is necessary to avoid troublesome shadows, and the units should be spaced a distance apart not exceeding one and a half times their height above the floor. As they can, if necessary, be spaced closer together, it will generally be possible to so arrange the lighting points that the unit comes over the centre line of each table. If the units are at heights of 12 ft. and upwards, little trouble from head-shadows, or reflected glare, should be experienced. Such troubles are further reduced when sources of light are equipped with diffusing glassware and when the shadows and contrasts are further softened by the presence of suitably-coloured walls and ceilings.

No unshaded lamp filament should be visible at any angle to persons reading at tables. It is also advisable to place a limit on the surface brightness of the envelopes that surround lamps when they are visible at an angle of less than 30 deg. from the horizontal line of sight of persons sitting at reading tables. When viewed within such an angle the average brightness should not exceed 5 candles per square inch, and no portion of the unit should have a brightness of more than 25 candles per sq. in. (any diffusing unit complying with British Standard Specification No. 324-1928 will have a maximum brightness not exceeding 5 candles per sq. in., which is approximately that obtained on the exterior of a 12-in. diameter opal sphere containing a 300-watt incandescent lamp).

Local Lamps

When supplementary local lighting is employed the illumination on the tables from all sources should not be less than 5 foot-candles and the general illumination should not be less than 1 foot-candle. Direct units (*i.e.*, directing not less than 90 per cent. of the total flux into the lower hemisphere) should be adopted for local lighting. The shades employed with stand-lamps on tables should be either opaque or of very low surface brightness (*i.e.*, not exceeding one candle-power per sq. in.) and should be of such a depth that bulbs do not protrude below the level of the lower rim; diffusing bulbs should preferably be adopted. The lighting unit, if of a fixed nature, should preferably be so placed that the ratio of the distance of the centre of the standard from the edge of the table to the height of the lower rim of the shade above the table is not less than three to two.

For newspaper stands a convenient method of providing additional light is by means of tubular lamps in trough reflectors situated slightly above and about 1 foot in front of the top line of the stand, completely concealing the lamp from the eyes of readers. The illumination from all sources on the surface of the stand should not be less than 5 foot-candles; reflectors may be faced with diffusing glass. The minimum illumination on the backs of the books when on their shelves should be 2 foot-candles. Special units may be used with advantage situated at the top of, and somewhat in front of, the shelves, so that the light may be most efficiently directed on the backs of volumes. Better illumination may be obtained by tilting the lower shelves.

The minimum illumination on card-index cabinets should be 5 foot-candles.

* Copies of both reports are obtainable from the Illuminating Engineering Society, 32, Victoria Street, London, S.W.1.

† A foot-candle may be defined as the illumination on a surface distant 1 ft. from a source of 1 candle-power and perpendicular to the direction from which the light is received.

Coal-oil

At a recent discussion on the claims of oil and coal as national fuels, under the auspices of the Fuel Committee of the Society of Chemical Industry, Dr. E. W. Smith, who presided, said that it was essential to bring the economic aspect of the issue before the country, and suggested that what was needed was action by independent people connected with the industries concerned who would make their recommendations and then have them legalised.

Dr. Lander, director of the Fuel Research Station, said that under present conditions it would be impossible to convert coal into oil in order to compete on a cost basis with natural oil, except to the limited extent to which it was possible to obtain oil as a by-product of a process. Hydrogenation held the most promising future. It was now possible to obtain 130 gallons of motor spirit from one ton of suitable coal; but, even so, it could not compete with the present world prices of petrol.

Sir Philip Dawson emphasised the need of developing supplies of home-produced oil against the requirements of any future national emergency.

Mr. K. Gordon, in giving the first description of the results of the hydrogenation process at Billingham-on-Tees, said that the treatment of bituminous coal by this process did not offer any engineering difficulties greater than those already overcome in the case of tar and heavy oil. It would not pay to carbonise coal intended for industrial purposes, such as the generation of electricity.

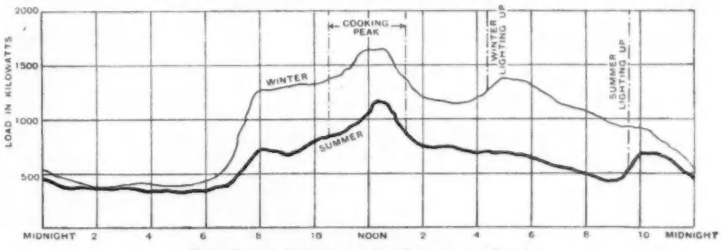
Progress in a Satellite Town. By A. T. Bullen, A.M.I.E.E.

Consumption per Domestic Consumer is a real Criterion of Development

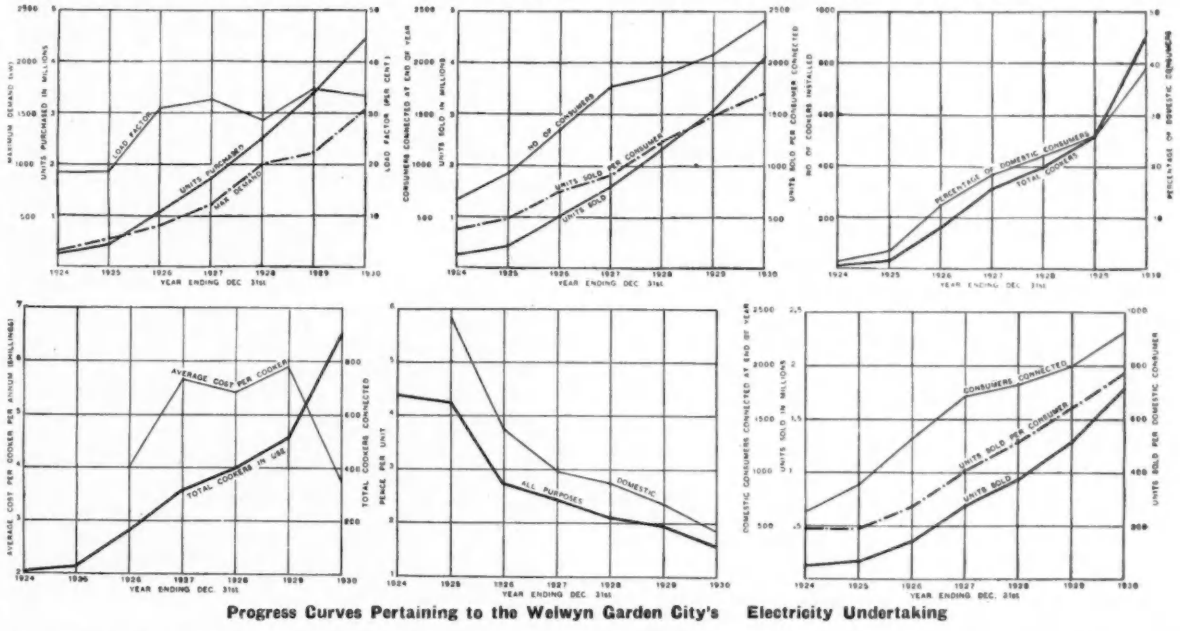
IN a new town like Welwyn Garden City, where the annual increase in the population is very high, no special merit can be claimed for the rapid growth of total sales, or of kWh sold per head of population, since in a small undertaking a single new power consumer may easily increase this figure by 50 per cent. Although the figure of 775 kWh per domestic consumer reached at December, 1930, is relatively good, there is every indication that by the end of this year the 1,000 mark will have been passed, as for the first quarter of this year 288 kWh was reached against 224 in the corresponding quarter of 1930. This figure includes every domestic consumer, *i.e.*, those who use electricity for lighting only. The proportion of domestic consumers cooking with a full-size oven (and excluding the table cookers in use) is all the more remarkable, as the figure of 39 per cent. shown on the curves at December, 1930, has now increased to 44 per cent. A cooker commonly supplied by the Welwyn Garden City Electricity Supply Co., Ltd., is the small Jackson No. 51 "J" model.

Any illusion that electric cooking is a luxury to be indulged in only by the rich is dispelled by the fact that in the Garden City the proportion cooking electrically in the council houses is higher than in the remainder of the town. Out of 743 council houses to date 347 are equipped with cookers, equivalent to 46.7 per cent.

The load curves given below are both for a Wednesday when the maximum peak is obtained. Monday shows practically no rise at mid-day, Tuesday a little more, Wednesday the maximum; Thursday, Friday, and Saturday usually somewhere between Tuesday's and Wednesday's peaks. Sunday, of course, shows the greatest actual cooking load, the peak reaching about 1.25 kW per cooker connected, but owing to the factory load being off the maximum peak reading is considerably less than on Wednesday. The other accompanying curves depict the progress made by the W.G.C. electricity undertaking and tell their own story.



Day Load Curves with Maximum Peaks



Progress Curves Pertaining to the Welwyn Garden City's Electricity Undertaking

Much food for thought for engineers who purchase in bulk is provided by a study of these curves. How many £ per kW standing charge, for instance, can they afford to pay and yet be able to sell electricity for cooking at a competitive figure?

Pressures Produced by Blowing Fuses

Safety in Mines Research Board Paper No. 67 (the Pressures Produced on Blowing Electric Fuse Links, by G. Allsop and P. B. Smith) has been issued by the Mines Department (H.M. Stationery Office, 6d. net). The work described was carried out in collaboration with the British Electrical and Allied Industries Research Association.

The arc following the blowing of a fuse link persists so long as the conducting path between the electrodes is maintained, the pressure accompanying blowing being closely related to the arcing energy. The present research was instituted to examine the possibilities of reducing the arcing energy and the arcing time by surrounding the fuse link by gases other than air, and thus to develop an effective "cartridge" fuse carrier using a gaseous filling.

In order to reduce the severity of arcing, it is necessary to suppress the conducting path of copper vapour either by cooling the vapour rapidly so as to condense it, or by converting it into a compound, such as the oxide, which is non-conducting. The ability of the surrounding gas to cool the copper vapour depends on its thermal constants, its effectiveness as a cooling agent being greater the higher the specific heat and thermal conductivity. The removal of copper vapour by chemical combination with the surrounding medium necessitates the use of a gas capable of combining vigorously with copper.

In the work described, fuse links of tinned copper wire have been blown by currents ranging from minimum fusing current to medium overload current at 200 volts d.c. in a closed rectangular thermally and electrically insulated vessel of 54.0 cu. in. capacity. The vessel was evacuated and filled with the gas under investigation at a known pressure, usually atmospheric. The gases used were: air at atmospheric pressure and under reduced pressure not exceeding 2 mm. of mercury; oxygen at one and two atmospheres; and nitrogen, hydrogen, chlorine, carbon dioxide, and argon, all at atmospheric pressure. Oscillograms and pressure records were taken during each experiment.

The paper contains 21 tables, setting out the results of the experiments undertaken.

The results show that when a fuse link is blown in a gas by currents up to 200 amperes at 200 volts d.c., the resultant pressure, arcing time, and arcing energy depend essentially on the thermal properties of the gas unless the gas and copper vapour can react. The higher the thermal conductivity and the specific heat of the gas the lower is the pressure produced, the shorter is the arcing period, and the smaller is the arcing energy.

When the gas and copper vapour can react, the pressure rise, arcing time and arcing energy are considerably reduced, irrespective of the thermal characteristics of the gas.

In hydrogen the extinction of the arc is so rapid that high over-voltages are induced and there is, in consequence, a danger of flash-over to the walls of the fuse box.

Book Reviews

Examples in Power Distribution and Electric Traction. By A. T. DOVER, M.I.E.E., A.Am.I.E.E. Pp. x+80; figs. 14. London: Sir Isaac Pitman & Sons, Ltd. Price 3s. 6d. net.

Many attempts have recently been made to increase the production of engineering problem books. Of these, Mr. Dover's book must certainly be regarded as an excellent volume. It represents a commendable effort to achieve the ideal combination of descriptive material with problems. The fact that Mr. Dover has produced a book with the best characteristics of both confirms our belief that an ideal problem book with worked examples is too much to expect. Nevertheless, the present book can definitely be recommended as outstandingly the best of its kind in its own field. Some of the difficulties in writing a book of this kind might be referred to. About half the space of the present book is devoted to 179 set problems. The remainder is taken up with descriptive matter, formulæ, and ten worked examples. If it were desired to assist students with their problems, so few worked examples would be inadequate. Concerning the formulæ, many are given without any clue as to their derivation, and the reader may well be tempted to "fill in the figures" without a complete understanding of the matter at issue. The query thus arises whether the space devoted to matter other than problems is useful or not. The reviewer thinks that the problem book should not in any way seek to displace the text-book.

The first section of the book deals with power distribution and transmission, both d.c. and a.c., balanced and unbalanced. The method given for solving doubly-fed distributors may not be found to be too readily understandable by the student. Questions on d.c. 3-wire distributors fed at both ends appear in the examples, but for these no assistance is given. Help is given in 3-phase, 4-wire, unbalanced-load problems by means of a worked example.

Part II, on traction, occupies most of the available space. In it, six sections deal with motors, their characteristics as modified by wheel wear and field weakening; control; speed-time curves; trackwork; feeding and distributing systems; convertors and rectifiers. Of the 20 questions in the final section about half are on sub-station machinery; only two are given on rectifiers. In a subsequent edition Mr. Dover might append some more, in view of the already great and rapidly growing importance of mercury-arc rectifiers for modern traction sub-stations. A reader who can solve the problems in this book without consulting the answers at the end can claim to be well acquainted with the technical side of the subject.

The price is extremely reasonable and the work exhibits the same painstaking care as Mr. Dover's other books. It is a pleasure to recommend it.

The Selenium Cell: its Properties and Applications. GEORGE P. BARNARD. Pp. 331. London: Constable & Co., Ltd. Price 35s.

Mr. Barnard's book is a feast of information on the work of others with this element, and he includes accounts of his own researches on conductance-change with intensity of illumination, voltage effect on light-sensitivity, and the effect of the wave-length of the incident light. In this connection one regrets that the admirable work of Berlin receives no mention.

To find the classic work of Professor Korn on compensating for the inertia of selenium cells discussed in so few words, revives the regret so many of his colleagues had, that this elegant method of really making a selenium cell comparatively reliable was lost to science by sheer lack of appreciation at the time. The subject deserves at least a chapter.

Dr. Toy's selenium photometer, to which one paragraph is devoted on page 231, is another instance of one of the few real successes of selenium, though even here selenium has been now rejected for the more satisfactory photo-electric cell.

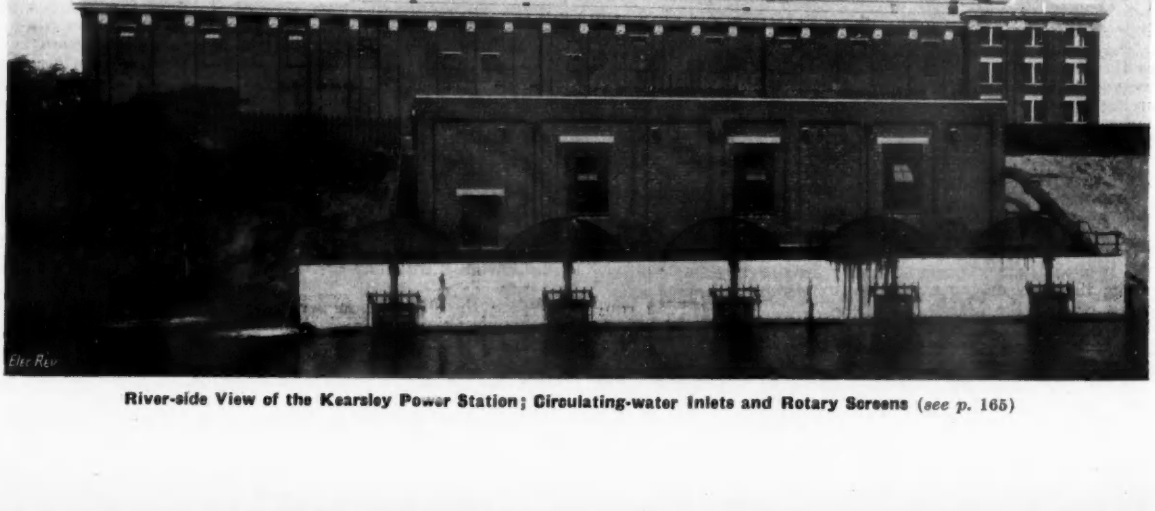
Selenium is still being used, of course, and with the heavy currents that can be passed through a suitable cell, it is far more practical than the photo-electric cell for certain types of automatic device. Whether selenium can eventually hold its own against the photo-electric cell for talking pictures remains to be seen. Four pages are devoted to this important subject, but the really fundamental work of Eugene Lauste with selenium is not mentioned. Lauste in 1912 reproduced music and speech admirably with selenium cells, and his patents with their extraordinary foresight cause many disconcerting moments to those engaged in this work nowadays.

To the experimental electrician or physicist Mr. Barnard's book can be heartily recommended. It will be for a future generation to discover how many of the laws and theories he deals with hold good when applied to numbers of cells used in commercial practice, and whether indeed any of us have yet solved the riddle of the way to make a cell that in any way does justice to selenium itself.

Artificial Resins. By JOHANNES SCHEIBER, Ph.D., and KURT SÄNDIG, Ph.D. Pp. vii+447; figs. 29. London: Sir Isaac Pitman & Sons, Ltd. Price 30s. net.

Artificial resins are rapidly increasing in commercial importance, and their further development is a highly promising field. The literature of the subject is still exceedingly meagre, in spite of the classical researches of Baekeland, Baeyer, Le Bach, and others.

The volume under review, which is a direct English translation of "Die Kunstlichen Harze," which was published in 1929, comprises one of the most comprehensive and systematic treatments which has been accorded to the subject of artificial resins. The translator has made no attempt to bring the subject-matter up to date, as there is no reference to the recent commercial development of the glycerine-phthalate ("Glyptal") resins, and "Glyptanite," the bonded mica product in which "Glyptal" is used instead of shellac in the manufacture of micanite sheets and tubes for electrical insulation, its special property being that it sticks firmly to a polished surface in both the intermediate and final stages. Throughout the whole volume but little reference is made to the extensive work carried out in this country on the subject of synthetic resins. The major portion of the volume is devoted to a general and theoretical treatment of the subject, dealing exhaustively with the chemical and colloidal aspects of the phenomena of resinification, the various condensation processes being classified and exemplified. The three final chapters are by far the most important chapters of the volume; they contain much practical detail and show considerable evidence of an intimate knowledge of the technical difficulties involved in the manufacture of cumarone-aldehyde, phenol-aldehyde, and urea-formaldehyde resins, respectively. Some attempt has been made to detail methods for the identification of synthetic resins of the phenol-aldehyde and cumarone-aldehyde types. An appendix details the German standard methods for the examination of electrical insulating materials, but these do not appear to be as exacting as the methods recommended by the B.E.I.R.A. Numerous references are given to the technical and patent literature. The book is well produced, and Dr. Fyleman's translation is very able, although there is some evidence of laxity in the proof reading.



River-side View of the Kearsley Power Station; Circulating-water Inlets and Rotary Screens (*see p.* 165)

Business and Industrial Notes

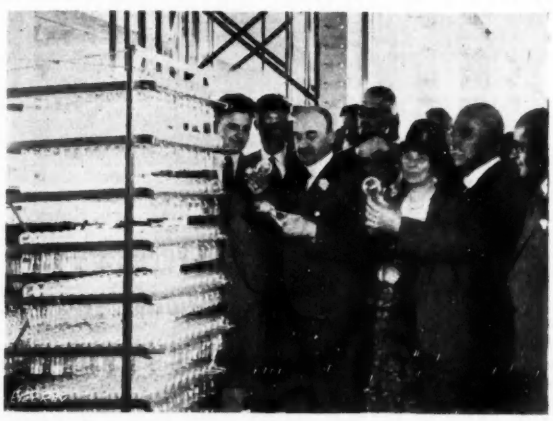
The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Marking Imported Insulating Tape

As a sequel to an inquiry held in April last (ELEC. REV., May 1st, p. 750) the Standing Committee under the Merchandise Marks Act, 1926, recommends that an Order-in-Council shall be made requiring imported electrical insulating tape to be marked with an indication of its origin upon sale or exposure for sale. The Committee considers that the proposals of the applicants (the Cable Makers' Association) for a mark both on the roll and on the wrapping are unnecessarily onerous for the purpose. It recommends, therefore, that each imported roll of adhesive tape for electrical purposes shall be required to bear an indication of origin stamped, printed, stencilled, impressed or embossed as follows:—(1) When the roll is sold or exposed for sale contained singly in a box carton or other container: On the box carton or other container or on a label securely affixed thereto. (2) When the roll is sold or exposed for sale wrapped singly in paper, tinfoil or the like covering, but with no container as in (1) above: On the outside wrapping of each roll, or on a label securely affixed thereto; and (3) In all other cases: On a label securely affixed to the side of the roll. It is proposed that the Order should not come into force until three months after the date on which it is made, or January 1st, 1932, whichever is the later date, to give traders sufficient time to dispose of existing stocks.

Contractors at Osram Works

On Thursday last week about 160 members of the Western Section of the Electrical Contractors' Association paid a visit to the "Osram" lamp works at Hammersmith and Wembley. The party, which was organised by Mr. W. E. Hobbs, manager of the Cardiff branch of the G.E.C., included the President of the Association (Mr. W. R. Rawlings) and Mrs. Rawlings.



Mr. and Mrs. Rawlings and E.C.A. Members at the Osram Works

The visitors were welcomed on behalf of the company by Mr. C. Wilson, director of the Lamp Works, who also presided at the luncheon. At the top table were Mr. and Mrs. Rawlings, Mr. C. C. Paterson, President, I.E.E., Mr. C. G. Morley New, President of the I.M.E.A., and Messrs. J. Y. Fletcher and H. W. Roberts, directors of the G.E.C. In the course of a speech after luncheon, Mr. Rawlings announced his intention to go "all out" for the purchase of British goods and the employment of British labour. Mr. Fletcher expressed his company's determination to serve the contractors and the public in the best possible way. The visitors included the Wembley Research Laboratories in their tour, and evinced great interest in the methods and processes which they inspected.

Russian Electrical Trading

The Commercial Counsellor to the British Embassy in Moscow (Mr. G. P. Paton, C.B.E.) has prepared a report on the organisation of foreign trade of Soviet Russia (Stationery Office, 9d. net). This explains in some detail the structure of the import and export systems employed by the Russian Government. The principal body concerned with the importation of electrical equipment is the "Electroimport," Kuznetsky Most 12, Moscow, whose scope embraces boilers, turbines, electrical equipment and accessories; dynamos, motors and cables for industrial use; miscellaneous equipment (including materials and semi-manufactures); and telegraph and telephone apparatus, &c. Kinematograph and lighting and projecting equipment is dealt with by the "Intorgkino." The "Metalloimport" is concerned with machinery imports, such as equipment for metallurgical works, the oil industry and mines, and its range includes power equipment, pumps, and hoisting and conveying machinery.

Russian imports of electrical machinery, apparatus, and accessories rose in value from 49.9 million roubles (£5,250,000) in 1928-29 to 65.3 millions (£6,870,000) in 1929-30. Under the heading "Metalware and electrical ware" Russia exported in 1929-30 13,000 tons, valued at 7.2 million roubles (£737,000), against 17,000 tons, valued at 7 million roubles (£716,000) in 1928-29. The report describes in some detail the methods of establishing and maintaining trade relations with the Soviet organisation.

"B.I." Ambulance Men

The accompanying picture shows the British Insulated Cables Division, Liverpool Corps, of the St. John Ambulance

The B.I. Ambulance Division

Brigade, upon the occasion of the recent annual church parade at St. Luke's Church, Liverpool. It is of interest as an example of the "extra-mural" activities of an electrical company.

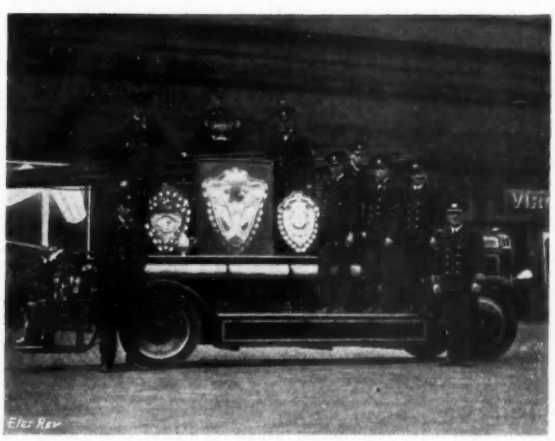
Irish Free State Electrical Imports

A very quiet tone continues to exist in the electrical trade in the Irish Free State, the imports of machinery and cognate apparatus during May last having been valued at only £44,035, bringing up the total for the first five months of the year to £278,508, a decrease of £86,130 as compared with the corresponding period of 1930. Details of the five months' imports are appended:—

	January-May. 1930. £	1931. £
Electrical machinery	119,672	74,784
Electric wires and cables	79,247	43,689
Electric lamps and parts	36,041	26,050
Wireless sets and parts	39,984	42,848
Other electrical goods	77,871	78,160
Copper wire	11,823	12,977
Totals ...	£364,638	£278,508

A Successful Fire Brigade

The accompanying picture shows the Rugby Fire Brigade of the British Thomson-Houston Co., Ltd., with its equipment. The illustration also depicts the trophies with the brigade has captured. It has recently had a remarkably successful career. During the National Fire Brigades' Association camp and tournament held at Morecambe from July 11th to 18th it secured first prize in the steamer drill, first in the hose-cart



The B.T.-H. Fire Brigade

drill, first in the escape competition and second in the motor-pump competition, in competition with brigades from all over the country. It was finally awarded the aggregate shield for the best total in six nominated drills. On its return to Rugby on July 18th the brigade was welcomed by Mr. A. P. Young, the works manager, and then participated in the B.T.-H. Annual Hospital Sports Carnival by which a large sum was raised for the Rugby Hospital.

Electricity Supply Workers' Wages

At a meeting in Manchester on Tuesday last the National Joint Industrial Council for the Electricity Supply Industry decided to maintain the existing agreement with regard to wages and conditions for a further month, *i.e.*, until the end of August.

"English Electric" to Make Mercury Rectifiers

The English Electric Co., Ltd., has completed arrangements for the manufacture and marketing of a comprehensive range of rectifiers of the steel-tank type. These will be made under licence from the Siemens-Schuckertwerk A.G. and with their close technical co-operation. The rectifiers will be made at the company's Stafford works.

Leeds Electrical Club

The members of the Leeds Electrical Club entertained their Sheffield Electrical Club colleagues at Roundhay Park, Leeds, on July 16th. The field day opened with cricket and splendid weather, Sheffield winning the "Neill" trophy previously held by Leeds. Leeds, however, turned the scale at bowls, and won the shield. Tea was served in the Mansion House, and was followed by a smoking concert. Mr. C. Wood (chairman of the Cricket Section, Leeds) proposed the toast of the Sheffield Electrical Club, and Mr. H. Clarke and Mr. Albrow (president and chairman, respectively, of the Sheffield Electrical Club) responded.

Thames House

Messrs. Knight, Frank & Rutley have sent us a beautifully-illustrated brochure describing the new Thames House on the Westminster Embankment which has been built to provide up-to-date office accommodation.

Notes for Jointers

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., have published the fourth of their "Notes for Jointers" series. This illustrates, stage by stage, with adequate details, the jointing of h.p. pole-mounted outdoor terminal boxes.

Mexican Import Concession

A recently-issued Mexican presidential decree for the purpose of encouraging the construction of power plants in Mexican border towns, which are at present supplied with "imported" electricity, accords duty-free entry for electric power plant, machinery and apparatus, with the exception of storage batteries, dry cells, and materials used in conducting electric current. The decree also provides for the continuance of the free importation of electricity until December 31st, 1931, after which it becomes dutiable at periodically increasing rates.

Import and Export Volumes and Values

The *Board of Trade Journal* publishes its customary tables comparing our overseas trade during the first half of the current year, with that in the corresponding period of 1924, and converting 1931 values into 1924 values. So far as electrical goods and apparatus are concerned, it is shown that the value of exports during the first half of this year was £4,151,000, as compared with £4,760,000 in 1924; in 1924 values this was equivalent to £4,724,000. The quantity is calculated at 99.2 per cent. of that recorded in 1924. With regard to imports, the total value was £2,383,000 (against £1,374,000 in 1924), equivalent in 1924 values to £3,418,000. The quantity was thus 248.8 per cent. of the 1924 quantity.

New Indian Company

The Ambala Electric Supply Co. is the name of a new concern which has been formed at Lahore, Punjab, with a capital of 5,00,000 rupees.

Neon Tube Patents in France

According to a French contemporary, M. Georges Claude, who claims the rights in the invention of neon luminescent tubes, recently brought an action against M. Marcel Abadie for infringement of the patents. In the First Court at Bordeaux a verdict was given in favour of the defendant, against which M. Claude appealed to the French Court of Appeal, which has, however, confirmed the First Court's verdict. M. Claude's claims are rejected, and legal authority is given to M. Abadie to continue the exploitation of his patents.

Agents Wanted

An American firm desirous of appointing agents in this country to sell its electric cooking ranges and wireless sets invites such to apply through the Editor of the ELECTRICAL REVIEW.

For Sale

The Midland Electric Light & Power Co., Ltd., has a quantity of plant for sale, including private plant, a.c. and d.c. motors, and dynamos.

Bromley Electricity Department invites offers for the purchase and removal of a rotary convertor, motor generator, and accessories.

(See our advertisement pages to-day.)

Social Events

BERRY'S ELECTRIC, LTD., held their annual outing on July 4th at Brighton, the party, including the directors and the staff in London, Birmingham, and Wembley, travelling by charabanc. On arrival, luncheon was taken at the Aquarium Restaurant. Good weather favoured the occasion, and after tea a number returned to London to visit a theatre, the Birmingham party travelling back to the Midlands by the midnight train.

The CHLORIDE ELECTRICAL STORAGE CO., LTD., held its annual gala, sports and horticultural show at its sports grounds at Clifton Junction, near Manchester, on July 18th. Amongst the numerous handicraft exhibits, sports, tennis tournaments, and side-shows the large attendance found much to divide its attention. Interest was shown in the horticultural section, where some fine specimens of greenhouse plants, flowers, fruit and vegetables all grown by employés of the company were exhibited. The crowd which watched the sports was treated to some keenly contested events, during which the Pendlebury Prize Band played musical selections. An entertaining feature of the programme was a display of gymnastics and tableaux by members of the Bolton Lads' Club. A number of Exide officials were present, and Mr. A. W. Browne, the assistant general manager, presented the sports and handicraft prizes to the winners. Dancing concluded an enjoyable day.

The staff and employés of INSULATORS, LTD., held their first annual outing on July 18th. Motor coaches took the party to Southend-on-Sea, where lunch was taken at Garon's Restaurant, Mr. W. Charles Waghorne presiding. It is hoped that the feature will become an annual event.

Book Notices

"Experimental Radio Engineering," by J. H. Morecroft. Pp. 345; figs. 250. Price 17s. 6d. net. "Fundamentals of Electricity and Magnetism," by L. B. Loeb. Pp. xx+432; illustrated. Price 20s. net. "Mining Electrical Engineering," by H. Cotton. Pp. viii+307; figs. 212. Price 15s. net. London: Chapman & Hall, Ltd.

New Catalogues and Lists

The JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, S.W.1.—An August calendar-blotter, illustrating the new Jackson cooking cabinets.

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—Publication H.O. 5884, describing in some detail (with illustrations) "Magnet" electric furnaces and ovens and their applications.

The METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester.—An 80-page brochure, copiously illustrated, describing various types of automatic electrical installations, including power and traction sub-stations, hydro-electric plants, voltage regulators, &c. This is the first of a series of four.

Messrs. J. J. EASTICK & SONS, 118, Bunhill Row, E.C.1.—A card bearing illustrations in colour of various patterns of "Eelex" terminals for radio work.

The EVER-READY CO. (GREAT BRITAIN), LTD., Hercules Place, Holloway, London, N.7.—A series of ten coloured folders relating to all types of "Ever-Ready" batteries, lamps, bells, &c. Also a complete reference catalogue for "Ever-Ready" retailers.

The TELEPHONE MANUFACTURING CO. (1929), LTD., Hollingsworth Works, West Dulwich, S.E.21.—An illustrated pamphlet dealing with the company's electric mains clocks to operate on a.c. circuits. Eight patterns are depicted (including wall clocks), and prices are given in each case.

The IGRANIC ELECTRIC CO., LTD., 143, Queen Victoria Street, E.C.4.—A 25-page booklet in which the company's amplifying and reproducing equipment is depicted and described, with prices.

INSULATORS, LTD., Derby Road Works, Montague Road, Edmonton, N.18.—A pamphlet containing data regarding synthetic resin mouldings, and another illustrating examples of "Bakelite" souvenirs produced by the company.

CARRON COMPANY, Carron, Falkirk.—No. VI of the "Famous Men and Carron Works" series, containing notes on Major-General Henry Shrapnel, whose shells were first made at the works.

The BRITISH THOMSON-HOUSTON CO., LTD., Rugby.—A booklet containing illustrated details and prices of the company's d.c. and a.c. fractional h.p. motors.

G.W.B. ELECTRIC FURNACES, LTD., Elecfurn Works, North Road, Holloway, N.7.—A folder advertising "Eternite" case-hardening compound.

Trade Announcement

MR. W. N. BISHOP, electrical and radio engineer, of Marlow Road Corner, Maidenhead, is removing his business on August 4th to 38, King Street.

Annual Holidays

The offices and works of Messrs. WATLIFF & CO., LTD., Merton Road, Wimbledon, S.W.19, will be closed from August 1st to 9th, inclusive. A small staff will be retained to deal with urgent orders.

MR. P. H. SMEDLEY, manufacturers' agent, 70, Whitehall Gardens, Chingford, E.4, announces that he is closing down from August 1st to 8th inclusive.

Price Reductions

MESSRS. W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., announce reductions in the prices of "Henley" insulating tape as from July 20th.

The "BEEANTEE" ILLUMINATIONS, LTD., announce reductions in the prices of their lighting strip lampholders as from July 27th.

Prices of Materials

Messrs. F. Smith & Co. report, July 28th: Copper (electrolytic) bars, £37 10s., 10s. dec.; ditto sheets, no change; ditto wire rods, £47 10s., 10s. dec.; ditto h.c. wire, 6-7/16d.; ½d. dec. Silicium bronze wire, no change.

Messrs. James & Shakespeare report, July 28th: Copper bars (best selected), sheet and rod, no change. English pig lead, £14, 5s. dec.

Messrs. Edward Till & Co. report, July 28th: India-rubber, Para fine, no change.

A Big Meter Order

The *Electrical World* says that when the General Electric Company (U.S.A.) meter department at Lynn recently booked an electric meter order from a New York concern, totalling more than a million dollars, one hundred men were called back to work and others were to follow.

Recent Contracts

The lighting of Withernsea, the Yorkshire seaside resort, is being changed over from gas to electricity and the electricity company has already commenced the conversion of existing equipment. Orders have been placed with the EDISON SWAN ELECTRIC CO., LTD., for the supply of cables and wiring, weatherproof lanterns and lamps, while Messrs. SMEDLEY BROS. (Derbyshire) are supplying the additional standards and brackets required under the scheme. The work is expected to be completed within a few weeks.

The Leicester telephone system, which was converted to automatic working in 1928, has been extended by two new exchanges, Stoneygate (1,860 lines) and Evington (760 lines); these were completed and put into service a week or so ago. A new automatic telephone exchange (1,280 lines) to be known as Hampton Exchange, has also just been completed to meet the increasing demands for telephone service in the Southampton Area. All these exchanges are of Messrs. Siemens Bros. and Co.'s No. 16 type, similar to the other exchanges in the areas mentioned.

Education in Business Administration

The London School of Economics has established a Department of Business Administration, in conjunction with a number of important firms and business leaders, with a view to developing the systematic study of current business and training young men and women for responsible commercial positions. Among the sponsors of the scheme are the General Electric Co., Ltd., and Standard Telephones & Cables, Ltd. A series of informal discussions has been arranged and among those who will open the discussions are Sir Andrew Duncan, chairman of the Central Electricity Board, and Mr. E. S. Byng, managing director, Standard Telephones & Cables, Ltd.

The Department's teaching will be organised from the standpoint of the individual firm and will include a study of the basic principles of administration and organisation, executive control, and the problems involved in adapting a business to external changes such as occur, for example, in market conditions. Students will be trained in the principles involved in staff problems and in accounting and business statistics as instruments of executive control. There will be courses dealing with marketing, production and business finance, including such detailed subjects as, for example, consumers' buying habits, the functions of advertising in business, departmental and multiple store control, the raising of capital, the control of investments and dividend policy.

Winding-up Order

MR. JUSTICE MAUGHAM, in the Companies Court on Monday last, made an order for the compulsory winding up of Gramo-Radio Amplifiers, Ltd., on the petition of the Universal Gramophone & Radio Co., Ltd.

Counsel for the petitioners said that the petition had stood over for a scheme of arrangement, but none had been put forward which would justify a meeting of creditors being called. The company did not appear.

Bankruptcy Proceedings

H. Cohen and S. Cohen, trading as the "Imperial Radio Manufacturing Co.," 24-25, Bayer Street, E.C.—A sitting of the London Bankruptcy Court was held on July 22nd, before Mr. Registrar Warmington for the public examination of these debtors, who return total liabilities of £1,773 (ranking £1,692) and net assets of £9. It was reported that in March last the debtors convened a meeting of their creditors when they offered 10s. in the £ by instalments; this offer was refused and a deed of assignment was executed in favour of Mr. C. Latham, of 78, New Oxford Street, which, however, was not registered. Thereafter they ceased trading and bankruptcy proceedings ensued. The debtors attribute their insolvency to general trade depression, heavy overhead expenses, pilfering, cutting of prices through keen competition, and losses sustained under broken contracts. The further examination of the debtors was adjourned until September 8th to enable them to furnish trading accounts.

P. M. Braidwood, electrical engineer, 37, Blackstock Road, Finsbury Park, and New Barnet.—The first meeting of creditors was held on July 23rd at London Bankruptcy Buildings, the debtor having filed his petition on July 8th. An order of adjudication was made the same day. The debtor states that he began business in 1921. Owing to bad debts and under-estimating of certain wiring contracts he fell behind and in 1927 executed a deed of assignment under which all the creditors (with the exception of the Jeary Electrical Co.) accepted 5s. in the £ on liabilities amounting to £700. The debtor continued business and also manufactured electrical appliances. He advertised extensively but during the past twelve months the business practically dwindled away, and being pressed by creditors he filed his petition. The accounts show liabilities of £476 and net assets of £9. The failure is further attributed to lack of capital and general trade depression. The case was left in the hands of the Official Receiver.

A. W. Bean, Eastgate, Sleaford, Lincs., electrical engineer.—The public examination of this debtor was held recently at Boston. The statement of affairs showed gross liabilities of £539 and assets of £17, leaving a deficiency of £442. The debtor stated that in March, 1925, he entered into partnership with his brother, but the partnership was dissolved in 1927, as the profits from the business were not sufficient to keep both of them. The debtor then commenced to trade as an electrical engineer. He admitted that three years ago he was aware that he had not sufficient property to pay off his debts in full, but continued as he had several contracts in view. The failure was attributed to loss on contracts and lack of capital. The examination was closed.

J. S. Blackburn, Borough Street, Castle Donington, Leicestershire, electrician.—The public examination of this debtor was held on July 21st at Derby. According to the statement of affairs, there were liabilities amounting to £331, against assets of £72. The debtor stated that he commenced business in 1929 with a capital of £10, which he borrowed. He attributed his failure to want of capital, general depression in trade, and the slump in prices. He stated that at the time he commenced business cables were being laid in the district, and he started in the hope of securing wiring and other contracts, but he was unsuccessful. The examination was closed.

W. H. Sayer, electrical engineer, 14, Rectory Road, Beckenham.—Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.1, appointed July 21st.

J. G. Roger (Radio Wants), wireless engineer, Butter Market Chambers, Butter Market, Ipswich.—Last day for receiving proofs for dividend, August 27th. Trustee, Mr. C. L. Nankivell, 5, Arcade Street, Ipswich.

C. W. Whitle, electrical sales engineer, 45, Fife Road, Darlington.—Last day for receiving proofs for dividend, August 12th. Trustee, Mr. C. L. Townsend, 80, High Street, Stockton-on-Tees, Official Receiver.

H. G. Edghill, electrical and wireless engineer, 13, Wembley Hill Road, Wembley.—First and final dividend of 2s. 3d. in the £, payable August 7th, at the Official Receiver's office, 29, Russell Square, W.C.1.

H. Roberts, electrical engineer and contractor, 41, Bloxridge Street, Langley, Oldbury.—Receiving order made, July 18th, on debtor's own petition.

P. A. Franks, electrical engineer's contractor, 5b, Bedford Square, Loughborough.—First meeting held July 29th. Public examination September 11th at the Castle, Leicester.

A. J. Hodges, 4, Binswood Street, Leamington Spa.—Trustee, Mr. F. E. Bendall, Midland Chambers, 3, Warwick Passage, Corporation Street, Birmingham, appointed July 17th.

W. F. Flint, electrical engineer, 53, Jameson Street, Hull.—Supplemental dividend of 2s. 3d. in the £, payable July 25th at the Official Receiver's office, 37, Scale Lane, Hull.

A. H. Start, electrical engineer, 6, Belle Vue Terrace, South Chard.—Receiving order made July 17th on debtor's own petition.

Company Liquidations

Adey Radio, Ltd., 99, Mortimer Street, W.—The first meetings of the creditors and shareholders were held on July 22nd at Carey Street, W.C. A compulsory winding up order was made on June 8th on a creditor's petition. Mr. H. P. Naunton, Official Receiver, reported that the company was registered on January 26th, 1929, to carry on business as manufacturers of and dealers in portable wireless sets. The nominal capital was £25,000, divided into 100,000 ordinary shares of 5s. each, but the only issue was two shares to the signatories. By an agreement dated January 21st, 1929, the company agreed to purchase from Adey Wireless, Ltd., and Mr. H. W. Adey, the latter's two patents relating to portable wireless sets and to take over the lease of a factory and showrooms. The consideration was agreed at £14,000 to be satisfied by a cash payment of £1,000 and the allotment of 50,000 5s. shares. The agreement, however, was never adopted owing to disagreement between the directors. The company did not proceed to allotment and applications for £650 worth of shares were returned to the subscribers. The company, nevertheless, carried on business without any paid-up capital, it being financed by Mr. Adey to the extent of £2,500. The liabilities to trade creditors are roughly estimated at £1,000 and in the absence of assets the liquidation was left in the hands of the Official Receiver. Bad trade is the cause assigned for the failure.

Sun-Ray Electric Lamp Co., Ltd., Buchanan Buildings, 24, Holborn, E.C.—The first meetings of creditors and shareholders were held on July 27th at Carey Street, W.C., before Mr. J. Barwick Thompson, Official Receiver. The compulsory winding-up order was made on the petition of the Neglin Lamp Co., Ltd., creditors for £94. The company was formed in March, 1929, with a nominal capital of £1,000 to carry on business as manufacturers of and dealers in all kinds of electric lamps. In the absence of a quorum both meetings were formally adjourned for one week but it was intimated that the liquidation would then be left in the hands of the Official Receiver.

R. Roberts, Ltd.—Winding up voluntarily. Liquidator, Mr. S. T. Howle, 63, Temple Row, Birmingham.

Devereaux, Ltd.—Winding up voluntarily. Liquidator, Mr. B. R. le Maistre, 4 Copthall Buildings, E.C.2. Particulars of claims by August 29th to the liquidator.

Nantwich Electric, Ltd.—Meeting, August 31st, at 46, Hospital Street, Nantwich, to receive an account of the winding up by the liquidators, Mr. G. A. Rackyleft and Mr. N. T. Afford.

Electricity Supply

Lighting, Domestic, Power

Accrington.—CHANGE-OVER.—The change-over of the Corporation's electricity supply from d.c. to a.c. will be completed by August.

Aylesbury. — LOANS. — The Town Council has received sanction to a loan of £5,000 for meters, and has applied for sanction to a further loan of £9,734 for an extension scheme recently submitted for a grant to the Unemployment Grants Committee.

Bath.—YEAR'S WORKING.—The accounts of the city electricity undertaking (engineer: Mr. J. W. Spark) for the year ended March 31st last shows an income of £117,590 and expenditure of £58,906, leaving a gross profit of £58,684. The figures for the preceding year were: Income, £108,576; expenditure, £53,829; gross profit, £54,747. After deducting loan charges there was a net profit of £10,480, as compared with £11,364 in the preceding year. The capital expenditure during the year amounted to £75,045 and included £37,836 for plant and machinery and £29,081 for mains and services. The sales of electricity increased from 17,154,312 to 21,138,471 kWh, and the maximum supply demanded from 8,200 to 9,700 kW.

Belgian Congo.—HYDRO-ELECTRIC DEVELOPMENT.—The initial plant at the hydro-electric power station near the Chutes Cornet established by the Société Générale des Forces Hydro-Electriques du Katanga, has recently been completed and put into operation, three sets of turbines and generators being now at work and producing a monthly total of 11 million kWh. Plans have been prepared for the erection of another hydro-electric station at the Chutes Cornet, and one between Lualaba and N'Zilo, but owing to the general industrial depression it has been decided not to proceed with their construction for the present.

Chester.—LOANS.—The City Council has applied for sanction to loans of £8,500 for providing a supply of electricity to the houses on the municipal estate at Lache, and £7,830 for transformers, h.p. and l.p. switchgear, battery, and cable connections for the sub-station in Northgate Terrace.

Continental.—GERMANY.—A return just to hand shows that the output of the 122 principal electricity supply undertakings in Germany during April last amounted to 1,134,200,000 kWh—the lowest monthly total so far this year—bringing up the total for the first four months of the year to 4,966,300,000 kWh, as compared with 5,680,000,000 kWh in the corresponding period a year ago.

HOLLAND.—The quarterly report of the Amsterdam Bank contains a communication by Mr. W. Lulofs, director of the Amsterdam municipal electricity works, concerning the electricity supply of Holland. It is stated that there are 23 central stations and 26 small stations. The average production of the large stations has risen from 12,000,000 kWh in 1919 to 61,200,000 kWh in 1929. In recent years an annual increase of about 14 per cent. has taken place in the consumption of electricity. In 1929 the supply works, as a whole, had an income of 93,329,000 fl. and total expenses, including interest and depreciation, of 65,353,000 fl., the net profits being 27,967,000 fl. or 43 per cent. of the income.

POLAND.—According to the recently-issued report of the Société Belge-Polonaise de Force et de Traction Electriques (Sobelpol), the serious industrial crisis through which the country is passing last year affected the demand for electricity supply in Poland, particularly as regards the generating stations at Dombrowo and Cracow; the output of the five plants controlled by the company amounted to 133,012,042 kWh, as compared with 133,064,287 kWh. The capacity of the various stations is 81,240 kW, but the average load last year was only 67,325 kW.

Croydon.—LOAN FOR DOMESTIC APPARATUS.—The Corporation Electricity Committee is to apply for sanction to a loan of £14,000 for the purchase of apparatus to be let out on hire

EXTENSION OF SUPPLY.—The Committee is to extend its electricity supply to Ham Farm at a cost of £2,800.

Ealing.—EXTENSIONS.—The Town Council has received sanction to the borrowing of £20,000 for the extension of h.p. and l.p mains and the installation of sub-station equipment, in order to supply electricity to various estates in the northern part of the borough.

East Ham.—CABLE EXTENSIONS.—The Corporation Electricity Committee is to extend distributor cables at a cost of £6,028.

Faversham.—PROPOSED PURCHASE OF UNDERTAKING.—At a recent meeting of the Town Council it was reported that the borough electrical engineer had been approached by a representative of a company regarding the purchase of the electricity undertaking. The Electricity Supply Sub-Committee recommended that the matter should not be considered until the Council was formally approached by letter addressed to the Town Clerk. This course was adopted.

FREE ELECTRICITY FOR DISPLAY PURPOSES.—With a view to organising the display of domestic electrical appliances, &c., interested local tradesmen are to be offered free electricity for a period of three months, to be used exclusively for the purpose of demonstrating these goods.

Great Yarmouth.—LOAN FOR MAINS.—The Town Council has received sanction to a loan of £30,000 for mains and services.

Grimsby.—SUPPLY TO LACEBY.—The Corporation Electricity Committee is to undertake distribution works in connection with a supply of electricity to Laceby at a cost of £7,858.

Hailsham.—ELECTRICITY SUPPLY.—The Weald Electricity Supply Co., Ltd., has informed the Rural District Council that it will strenuously oppose the application by the Council for the revocation of the Special Order, and has intimated that notice had been served with a view to extending the mains to the Maygarland at Horeham Road. The Electricity Sub-Committee has been given powers to take all possible steps in the interests of the district as a whole, with a view to expediting a supply of electricity throughout the district, and has appointed a deputation to attend an interview with a representative of the Electricity Commissioners.

Halifax.—YEAR'S WORKING.—The Corporation Electricity Department made a net profit of £27,000 for the year ended March 31st last, and the Electricity Committee recommends the abolition of all meter rents as from October 1st next. The borough electrical engineer has also been asked to prepare a report as to further concessions which might be made to consumers.

Hellingly (Sussex).—ELECTRICITY SUPPLY.—At a meeting of the Parish Council held on July 21st it was reported with regard to the request for the revocation of the Order held by the Weald Electricity Supply Co., Ltd., that the company had provisionally agreed to terms with the Central Electricity Board for a supply in bulk from the sub-station at Hailsham. The work of laying mains at Hellingly is to be put in hand, and a supply will be available before the end of the year. In view of these facts the Electricity Commissioners state that they do not feel justified in recommending the Minister to interfere with the company's powers.

Hemel Hempstead.—ELECTRICITY SUPPLY EXTENSIONS.—The Luton Town Council has informed the Rural District Council that a supply of electricity will be available for Markyate and Cheverells Green in about two months' time, and that the supply will be extended to Flamstead if the demand justifies it. The cost of the latter extension would be about £1,200.

Hull.—ELECTRICITY AGREEMENT.—An agreement has now been reached between the Corporation Electricity Committee and the Tramways Committee relative to the former taking over all matters in connection with the supply of electricity to the tramways. The terms include the taking over of all cables including the underground cables from the old tramway station to the street section pillars which supply the overhead trolley line, and the taking over of the staff from the tramways, the latter being subject to certain conditions. The Electricity Department is to maintain, and be responsible for, all underground feeder cables on an actual cost basis, but the cables remain the property of the Tramways Department. No extra charge for the supply of electricity for the tramways is to be made at present.

Irish Free State.—CORK.—The Corporation General Purposes Committee has adopted a proposal for the improvement of the public lighting in certain streets. It is suggested that streets in which both gas and electricity are available for lighting should be chosen, and that tenders should be invited for each method of lighting.

Japan.—COLLIERY SUPPLY.—It is reported from Tokyo that with the object of controlling the supply of electricity generated at Japanese collieries in the Kwansai district a new company authorised by the Japanese Government is being organised with a capital of about two million sterling. Four of the leading electricity undertakings are interested in the new concern, the initial plant of which will have a capacity of 105,000 kW, to be extended later to 300,000 kW.

Taunton.—ASSISTED WIRING SCHEME.—The Town Council has decided to extend the scheme of assisted wiring of small dwellings to the area outside the borough. There will be an extra charge of 4½d. per kWh above the flat rate in force in the borough to cover the cost, maintenance, and lamp renewals.

Keighley.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. H. Webber) for the year ended March 31st last shows a total revenue of £88,505, as compared with £88,439 in the preceding year. Working expenses amounted to £45,956 (against £47,729), leaving a gross profit of £42,550. After providing for capital charges, &c., there was a net profit of £2,556, as compared with £1,601 for 1929-30. The electrical energy sold increased from 14,635,296 to 14,653,792 kWh, and the maximum supply demanded from 7,732 to 8,235 kW. The average price obtained per kWh fell from 1.388d. to 1.371d.

Lancaster.—YEAR'S WORKING.—The report on the working of the Corporation electricity undertaking (engineer: Mr. G. C. Milnes) for the year ended March 31st last shows a total income of £60,076, and working expenses of £35,505, leaving a gross profit of £24,571, to which was added revenue from other sources, making £37,268. Capital charges absorbed £26,569, and there was a net surplus of £10,699. The capital expenditure during the year amounted to £40,409, and the amount now spent on the undertaking stands at £301,682. There was a considerable increase in the sales of electricity the total being 11,475,812 kWh, as compared with 6,494,924 kWh in the preceding year.

LOAN SANCTIONED.—Sanction has been received from the Electricity Commissioners to the borrowing of £2,500 for the extension of the Morecambe electricity supply to Middleton and Overton.

London.—SUPPLY COMPANIES' PROFITS.—In reply to a question at a meeting of the L.C.C. on July 21st, Mr. F. B. Galer, chairman of the Highways Committee, stated that the Notting Hill, St. James' and Pall Mall, South London, and South Metropolitan supply companies carried forward excess balances at the end of last year, and it was being suggested that they should make rebates and allowances to consumers. The Council had also intimated to the companies concerned that it expected them to bring the balances carried forward within the maxima allowed.

FULHAM.—The Borough Council is seeking sanction to the borrowing of £12,500 for rental wiring installations, £5,000 for the purchase of domestic apparatus, and £40,000 for generating station extensions.

ST. PANCRAS.—The Borough Council Electricity and Public Lighting Committee recommends the extension of mains at an estimated cost of £1,793.

Newport (Mon.).—SPECIAL ORDER.—Application has been made for a Special Order authorising the Corporation to supply electricity in part of the urban district of Caerleon and part of the rural district of Magor.

Portsmouth.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. B. Handley) for the year ended March 31st last shows a total revenue of £304,516, as compared with £274,029 in 1929-30, and working expenses of £170,437, against £165,419, leaving a gross profit of £134,078 (£108,610). To the gross profit was added income from other sources, making £136,926, and after payment of capital charges, &c., there was a net profit of £19,783, as compared with £5,554 in the preceding year. The capital expenditure during the year amounted to £81,268, making the total spent on the undertaking £1,292,463. The sales of electricity increased from 34,191,843 to 39,863,337 kWh, and the maximum supply demanded from 16,400 to 19,000 kW.

Preston.—MAINS EXTENSIONS.—The Corporation Electricity Committee is extending mains at Upper Rawcliffe, at a cost of £11,900, and also at Longton, Broughton and Grimsargh.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

BATH.—Lighting: 5d. per kWh. Power, heating and cooking: First 3,500 kWh per quarter, 1¼d. per kWh; next 16,500 kWh, 1d.; beyond, 0.8d. Two-rate tariff: All electricity used between 4 p.m. and 10 p.m., 5d. per kWh; other hours, 1¼d. Combined rate: Consumers using electricity for power, heating or cooking to be allowed lighting supplies at power rates up to 10 per cent. of the power consumption, provided that accounts are paid within one month. Domestic rate for private residences and flats when separately rated: ½d. per kWh for any purpose, with reductions ranging from 2s. to 2s. 6d. per annum in the standing charges. Late shop window lighting, &c.: From 2d. to 1½d. per kWh.

HOYLAKE AND WEST KIRBY.—Lighting: From 5¾d. to 5½d. per kWh. Meter rents: A reduction of 3d. per meter.

SKIPTON.—Lighting: A reduction of ½d. per kWh. A minimum half-yearly charge of 15s. to ordinary consumers is also to be substituted for the minimum quarterly charge of 7s. 6d.

Scarborough.—NEW ELECTRICITY CHARGES.—The Town Council proposes to introduce a new alternative two-part tariff for domestic consumers, with a fixed charge based on the floor area of the premises and a "unit" charge of ¾d. For shops, offices, factories and hotels, there will be a fixed annual charge of £12 per kW of lighting installed for the first 20 kW and £6 for each additional kW, plus ¾d. per kWh consumed (minimum charge of £1 per quarter).

South Africa.—ELECTRICITY TARIFFS.—Durban has the distinction of selling electricity at a cheaper rate than any other town in the South African Union. A special report recently issued by the Director of Census on the consumption of electricity (private dwellings) during September, 1930, shows that the average charge per kWh was 0.989d. in Durban as against 1.708d. in Maritzburg. The average charge per kWh in Johannesburg was 2.862d.; in Bloemfontein 1.84d.; Pretoria 1.889d.; Port Elizabeth 2.034.; Capetown 2.690d.; East London 2.852; Krugersdorp 3.026; Germiston 3.448.; Benoni 3.450d.; and Kimberley 4.948d. These findings were based on the statistics applying to 90,402 households in twelve towns which consumed between them 8,134,368 kWh in the month of September, 1930, or an average of 90 kWh per household. The range in consumption, states the report, is, however, very varied; 59.51 per cent. of the households consumed less than 50 kWh each, while 11.43 per cent. consumed over 200 kWh, or an average of 424.8 kWh each. Those consuming under 50 kWh per month paid, on the average, at the rate of 4.2d. per kWh, and those consuming over 200 kWh at the average of 0.99d. per kWh.

PRETORIA.—The July issue of *Pretoria's Monthly Bulletin* contains a diagram illustrating the growth in the sales of electricity by the Municipal Electricity Department. In 1920 the total sales were 6,283,000 kWh; by 1930 they had risen to 27,614,000 kWh. The sales for 1931 are estimated at 38 million kKh, representing the greatest advance made since the inception of the undertaking.

Stoke-on-Trent.—SUPPLY TO OAKHILL.—The Corporation Electricity Committee has decided to apply for sanction to borrow £11,000, the estimated cost of a sub-station building and equipment at Oakhill, together with l.p. mains and an e.h.p. feeder from Stoke to Penkhull and Oakhill. Application has also been made for sanction to a loan of £2,100 for mains to give a supply of electricity to houses to be erected on the Holden Farm estate.

SUPPLY TO COBRIDGE.—The Committee has instructed the electrical engineer to prepare a scheme for a supply of electricity to premises at Cobridge by means of overhead lines.

MAINS EXTENSIONS.—Mains are to be laid from Silverdale Road sub-station, Wolstanton, to Moreton Parade, at an estimated cost of £2,600.

Walsall.—YEAR'S WORKING.—The report on the working of the Corporation electricity undertaking (engineer: Mr. H. A. Howie) for the year ended March 31st last shows a total income of £128,836, and working expenditure of £89,070, leaving a gross profit of £39,767. The figures for the preceding year were: Income, £123,188; working expenses, £80,719; gross profit, £42,469. After providing for capital charges there was a net surplus of £12,466, as compared with £13,654 in 1929-30. The capital expenditure during the year amounted to £54,673, the chief item being £35,572 for feeders and distributors. The sales of electrical energy increased from 19,796,707 to 20,746,312 kWh, and the maximum supply demanded from 6,953 to 7,787 kW.

MAINS EXTENSIONS.—The Corporation Electricity Committee is to extend mains at a cost of £1,650 to supply a new housing estate at Bentley Moor.

ELECTRICITY IN BULK.—A bulk supply is to be provided to Trent Concrete Co., Ltd., at its gravel crushing plant at Great Barr, at a cost of £500.

Walton-on-Thames.—ELECTRICAL DEVELOPMENT.—The Urban District Council has received sanction from the Electricity Commissioners to the borrowing of £17,569 out of the £21,000 applied for, in connection with its 1931 development scheme. The Commissioners state that consideration will be given to sanctioning the other items when the Council decides to proceed with the work.

Wincanton.—PROGRESS OF THE ELECTRIFICATION SCHEME.—The Wessex Electricity Co. has informed the Rural District Council that it is proceeding with the scheme for the electrification of Wincanton, and that overhead mains are to be erected in the villages of Holton, North and South Cherrington, Horsington, Templecombe, Stoke Trister, and Cucklingham.

Traction

Argentina.—BUENOS AIRES.—The *Monthly Review* of the Bank of London and South America, Ltd., states that the construction of the second section of the Lacroze subway goes ahead steadily, and it is hoped that the Callao-Carlos Pellegrini addition will shortly be available for public service. When the line will be completed to the Avenida Leandro N. Alem cannot be exactly stated, but a term of between six and eight months has been mentioned by the contractors.

Colne.—YEAR'S WORKING.—The statement that the life of the Corporation's tramway track is ended and that replacement or abandonment is overdue, is made in the annual report of Mr. J. H. Thompson, engineer and manager of the tramway undertaking. There were deficiencies of £7,881 on the tramways and £345 on the omnibuses.

Leeds.—TRACK RENEWALS.—Reconstruction of the tramway track in Wellington Street, Tong Road and Beeston Town Street is to be undertaken at an early date by the Corporation Tramways Committee.

Liverpool.—YEAR'S WORKING.—We have received from Mr. P. Priestley, general manager of the Corporation tramway and omnibus undertaking, a copy of his report, together with the statement of accounts for the year ended March 31st last. The total revenue from the tramways amounted to £1,405,505, and operating costs, including rental of leased lines, were £1,216,032, leaving a gross profit of £189,474. The figures for the preceding year were: Revenue, £1,439,103; operating costs, £1,208,510; gross surplus, £230,592. After payment of interest and sinking fund charges (£100,300) and income tax, there was a net surplus of £85,577, as compared with £123,627 in the preceding year. From this was deducted a deficit on the motor-omnibus service, leaving £16,384, which was transferred to reserve, renewal and depreciation fund. The amount spent on renewals during the year was £136,035, reducing the reserve renewal fund to £94,107. The report states that unless there is a big increase in the number of passengers carried there is likely to be a deficit on the whole undertaking at the termination of the current year. The number of passengers carried by the tramway decreased from 261,574,927 to 256,789,130, and the car miles run from 20,207,802 to 19,953,839. The earnings per car mile also fell from 16.79d. to 16.61d. The new bogie truck tramcar with worm gear, which was placed in service on October 15th, 1929, has proved successful, and the Tramways and Electric Power and Lighting Committee has authorised the purchase of 12 of the same type; the bodies will be built at Edge Lane works.

London.—L.C.C. TRAMWAY ACCOUNTS.—The report on the operation of the tramways during the year ended March 31st last was submitted by the Highways Committee at a recent meeting of the London County Council. The total revenue showed a decrease from £4,460,536 to £4,363,566, the working expenditure being £3,599,668, as against £3,613,329 in the pre-

ceding year. There was thus a gross profit of £763,899 (£847,207) to which was added £2,072 (unclaimed war service allowances), making a total of £765,971. Capital charges totalled £734,334 and there was a net surplus of £31,637, as compared with £128,804. This decrease in the surplus is stated to be due largely to bad trade conditions and the prevalence of unemployment, traffic receipts being £90,227 less than in 1929-30. The surplus for the year under review (£31,637) is £1,342 less than the revised estimated surplus for the year and £57,774 less than the original estimated surplus. It is proposed to carry the surplus forward to the 1931-32 account. The total number of passengers carried during the year was 717,386,114 and the number of car-miles run was 70,127,630; the corresponding figures for the previous year were 729,414,871 and 70,756,225. The average receipts per car mile decreased from 14.79d. to 14.61d. The length of route operated by the Council at March 31st amounted to 166 miles. The total net capital expenditure on the undertaking up to March 31st was £18,352,317, of which £633,119 represents expenditure during 1930-31. The amount of the debt incurred up to the end of that period totalled £18,762,368, and the net debt outstanding after allowing for debt repaid and sinking fund balances, was £8,383,612. The sums paid to metropolitan borough councils and the City Corporation for rates on the permanent way amounted to £27,967; this amount was in addition to rates (£71,924) paid by the Council in respect of tramway offices, power stations, car sheds, sub-stations, depôts, &c. The amount charged up to the end of the year to the tramway capital account for effecting street improvements along tramway routes, under resolutions already passed by the Council, was £752,013.

THE TRANSPORT BOARD.—It was stated by Mr. Herbert Morrison last week that the London Passenger Transport Board was expected to start work in January next.

Preston.—YEAR'S WORKING.—The accounts of the Corporation tramway undertaking (general manager: Mr. H. Clayton) for the year ended March 31st last, show a total income of £84,914, a decrease of £4,320 as compared with 1929-30. Working expenses amounted to £65,791, as against £70,048, leaving a gross profit of £19,122 (£19,186), and after meeting capital charges, &c., there was a net profit of £5,864, as compared with £3,574 in the preceding year. The number of passengers carried decreased from 15,885,844 to 15,209,874, and the car miles run from 1,207,723 to 1,167,833. The total revenue per car mile fell from 17.732d. to 17.451d.

Sunderland.—YEAR'S WORKING.—The annual report of the Corporation tramway undertaking for the year ended March 31st last shows a net profit of £120,110, as against £126,257 in the previous year. The number of passengers carried decreased by over 1,500,000. The loss of passengers on certain routes is ascribed to bad trade and the withdrawal of a number of early workmen's cars. Dealing with the experiment of running a modern tramcar in direct competition with the 'buses on the Tatham Street route, the report says that the majority of the public prefer the modern tramcar to the modern 'bus.

Tynemouth.—AUTOMATIC TRAFFIC CONTROL.—The Corporation Watch Committee is considering a scheme for the provision of automatic traffic signals at a number of road junctions.

Telegraph and Telephone

Abyssinia.—NEW RADIO STATION.—Ras Tafari, the Emperor of Abyssinia, recently laid a corner stone of the new radio station which the Government is erecting at Addis Abeba.

Irish Free State.—WIRELESS BEACONS.—From the office of the Irish Lights Board in Dublin a statement on wireless direction-finding stations on the coast of Ireland was issued to the effect that the Mizen Head beacon signal has been in operation since January 1st last, and that the Tory Island beacon will be operating in about two months' time. A regular wireless beacon is to be established at Coningbeg. A conference on wireless beacons has provisionally fixed wavelengths and ranges for Innisbearagh, Eagle Island, Arran North, Old Head of Kinsale, and Kish. The Irish Lights Board is seeking for financial sanction for the installation of these beacons.

Italy.—TELEVISION INSTALLATION.—Television apparatus is being installed at Rome by the Ministry of Communications. The apparatus is said to be one of the most perfect of its kind, and it will work in connection with the chief foreign centres.—*Reuter's Trade Service.*

Manchuria.—RADIO-TELEGRAPHY.—Direct wireless telegraph communication between Mukden and San Francisco has recently been inaugurated by an American company. The new connection, in conjunction with the present radio service between Mukden and Berlin, now provides Mukden with a round-the-world system of wireless communication.

New Zealand.—RADIO-TELEPHONY.—The new radio-telephone service between all parts of Great Britain and Northern Ireland and all parts of New Zealand became available on July 23rd, *via* Sydney, Australia. A number of calls were put through in both directions and transmission and reception were satisfactory.

Radio-telephony.—NEW FACILITY.—The Post Office announces a new facility for users of the radio-telephone services to Argentina, Australia, Brazil, Canada, Chile, Cuba, Mexico, New Zealand, Uruguay, the United States, and to ships at sea. In booking a call any subscriber may in future ask for the call to be limited to three or more minutes as he wishes, and the London trunk exchange will terminate the connection as soon as the caller has had the specified period of effective conversation, unless he asks for an extension. If the caller does not fully use the time for which he has asked he will be charged only for the effective time actually used, subject to the usual minimum of three minutes.

The Telegraph Service.—"TELEPRINTER" EXCHANGE.—It is understood that a "Teleprinter" exchange is being equipped at the central telegraph office in London. It will enable subscribers to communicate with each other by means of typewriter-like instruments and to carry on written "conversations." Among the advantages of the system are that a typed record is kept of all messages at both the sending and receiving ends; speed of communication, secrecy, and the ability to send messages even if there is no attendant at the instrument of the called subscriber. In its initial stage the system will at first be worked in the London area only. There will be ample opportunity to attain a high rate of speed, since subscribers will become their own telegraphists, the speed of the instrument being limited only by the operator's abilities.

The Telephone Service.—EXTENSION CHARGES.—The Postmaster-General has announced the reduction of the quarterly charges made for both residence and business extension lines, and substantial reductions are also to be made in the charges for private long-distance circuits.

South Africa.—RADIO-TELEPHONY.—The Minister of Posts has announced that an arrangement has been made for commercial wireless telephony between South Africa and Great Britain. The local Communications Company will operate the service from Capetown, the British end being controlled by the Post Office stations, Rugby dispatching and Baldock apparently receiving. Local telephone subscribers within a 300-mile zone of Capetown will be able to use the service, and the Union Government explicitly reserves the right to terminate the service through the Communications Company at any time. It has not abandoned its intention of erecting its own station near Johannesburg, but is postponing it until times are better.

Radio

Denmark.—RADIO INTERFERENCE.—Over sixteen electricity generating stations have taken the initiative in combatting radio interference which might result from the operation of their own machinery. Twenty-nine power stations have altered their conditions for the supply of electric current and, in addition, made alterations to their plant. According to Messrs. Philips Lamps, Ltd., as a result the standard of radio reproduction in Denmark, especially in the vicinity of power stations, leaves nothing to be desired.

Germany.—LICENCES.—On July 1st, 1931, the number of licences in use was 3,719,594, including 168,560 issued to the blind, incapacitated ex-soldiers, unemployed, &c., free. Compared with the figures of April 1st, 1931 (3,731,681) this means a decrease of 12,087, or 0.3 per cent. The "free" licences have increased by 34,429. Compared with July 1st, 1930, the figures show an increase of 494,650, or 15 per cent. According to *World-Radio* there would appear to be 57.7 receiving sets for every 1,000 inhabitants. During the same period in previous years the decrease was 0.4 per cent.

Italy.—SCHOOL INSTALLATIONS.—With the object of creating greater use of radio receiving sets in country districts a scheme is under consideration to provide all village schools with receiving sets and to broadcast special messages to farmers and villagers.

Radio Exchanges.—COVENTRY.—Experiments are being made with a relay system which may develop to such an extent that it will enable subscribers to receive alternative programmes by inserting a wall plug and "dialling" a loud-speaker. The General Electric Co., Ltd., is said to visualise a time, not far distant, when its relay stations in the Midlands will select the best items from programmes in this country and abroad, and, at the same time, offer several alternative programmes to listeners.

The Coventry Corporation has given the company permission to wire the 800 houses on its Radford estate and this work is now being carried out. Two overhead wires are run to each house, the occupant being charged 1s. 6d. a week for a day and night programme and 9d. a week for a loud-speaker, which he pays for in a year. The system is to be extended to other parts of Coventry, and negotiations are in progress for wiring houses in Birmingham and in other Midland towns.

Relaying.—NEW CABLES.—A complete new system of cables connecting B.B.C. broadcasting stations has recently been laid by the Post Office for the improvement of programme relays. The special lines are now available for a 24-hours relay service. Hitherto relay lines have been at the B.B.C.'s disposal for evening use only, and it could only call on them between 6 p.m. and midnight.

Switzerland.—LICENCES.—On June 1st, 1931, the number of licences in use was 116,527, of which roughly 87,000 were in the German-speaking part of the country, 27,000 in the French-speaking part, and about 2,000 in the Italian-speaking (Tessin) quarter. The total increase in listeners from January 1st to June 1st was 13,219, being about equal to the total increase for the whole of 1929. *World-Radio* says that during the month of June the 120,000 mark was passed.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—September 15th. Posts and Telegraphs Department. Instrument cords. (A.X. 11023.)*

Ayr.—County Council. Electric lighting of 54 houses. Schedules from Mr. Wm. Reid, county architect, 14, Wellington Square.

Belgium.—BRUSSELS.—August 12th. Belgian Telegraph and Telephone Department. Supply and laying of telephone cables and accessories at Ghent, Eecloo, Roulers, Waereghem, and Saint Nicolas-Waes. Particulars (Cahier des Charges Special No. 3-577) for 17½ fr. from Régie des Télégraphes et Téléphones, Brussels.

China.—CHINESE GOVERNMENT PURCHASING COMMISSION.—L.p. cable and d.c.c. copper wire. (July 17th.)
Frequency changer. (July 24th.)

Denmark.—COPENHAGEN.—August 7th. Municipal Lighting Department. Paper-insulated and rubber-insulated cables. (A.X. 11041.)*

Dumfriesshire.—August 14th. County Council. Supply and erection of 33-kV and 11-kV overhead distribution lines. (July 17th.)

Dundee.—August 19th. Corporation. L.p. cable. (See this issue.)

Egypt.—CAIRO.—August 24th. Ministry of the Interior. Electric lighting installation for the town of Akhmim, near Sohag. (A.X. 10970.)*
August 13th. One 40-kVA and one 20-kVA air-cooled three-phase transformers for Zifta Municipality. (A.X. 11001.)*
August 20th. Two step-down power transformers of 50 kVA and accessories for the Assiout power station. (A.X. 10985.)*

Glasgow.—August 5th. Corporation. Electrical installation at Stirling's and Kinning Park Libraries. Specifications, &c., from office of Public Works; offers to Town Clerk.
August 12th. Gas Department. Static condensers. (July 10th.)

India.—SIMLA.—August 17th. Indian Stores Department. Oil engine driven d.c. generating set, rotary balancer and electrically-driven centrifugal pumps. (A.X. 11026.)*

Inverkeithing.—Town Council. Electric lighting at housing scheme. Schedules (£1 1s. deposit) from Mr. R. H. Motion, architect, Union Bank Chambers, High Street, Dunfermline.

Liverpool.—August 28th. Electricity Supply Department. 6,000-V metalclad switchgear for Highfield Street sub-station. (See this issue.)

London.—CENTRAL ELECTRICITY BOARD.—August 10th. 35-kV switchgear at Padiham and Burnley for North-West England and North Wales Electricity Scheme. (July 17th.)
COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.—August 10th. Supply and erection of a 33-kV overhead line in Kent. (July 17th.)
August 24th. Transformers in connection with the extensions to the Barking power station. (July 24th.)
L.C.C.—August 24th. High-pressure steam and circulating water pipes, de-superheating plant, electrically-driven circulating water pumps, strainers, &c. (July 24th.)
ISLINGTON.—September 9th. Borough Council. Laying distributor cables and earthenware pipes in certain thoroughfares. (July 24th.)

New Zealand.—WELLINGTON.—August 28th. Post and Telegraph Department. 500 microtelephone handles. (A.X. 10980.)*
September 2nd. 100 telephone bell gongs. (G.X. 10562.)*
September 3rd. Telephone transformers, transmitters, earpieces, mouthpieces, &c. (A.X. 11007.)*
September 7th. Telephone cords. (A.X. 11043.)*
September 8th. 1,000 three-way telephone plugs. (A.X. 11006.)* 100 four-conductor cords. (A.X. 11046.)*
September 15th. Automatic dial mountings and resistance spools. (A.X. 11042.)*
September 22nd. 63 miles of v.i.r. wire. (A.X. 11039.)*
Public Works Department. October 20th. Boosting transformers. (A.X. 11040.)*

Northern Ireland.—ATHLONE.—September 2nd. Urban District Council. Supply, erection and maintenance for 12 months of three centrifugal water pumps with electric motors and switchgear. (July 24th.)
BELFAST.—August 12th. Electricity Board for Northern Ireland. L.p. distribution systems in Comber and Newtownards, Co. Down. (July 17th.)
August 17th. Sub-station equipment, including transformers, switchgear, meters and distribution boards. (July 17th.)

Panama.—Diesel-electric generating plant developing from 100 to 125 h.p. (G.X. 10521.)*

South Africa.—JOHANNESBURG.—August 20th. Municipal Council. Electricity meters and time switches. (A.X. 11035.)*
August 29th. 1,000-kW rotary convertor, &c. (A.X. 11047.)*
PRETORIA.—September 18th. Town Council. Switchgear and auxiliary apparatus required in connection with the installation of one or, alternatively two, 12,500-kW sets. (A.X. 11037.)*

Southend-on-Sea.—August 19th. Electricity Department. Twelve months' supply of cooking apparatus, domestic water-heating apparatus and domestic washboilers. (See this issue.)

Staffordshire.—August 27th. County Education Committee. Electric lighting and power installations in schools. (See this issue.)

Turkey.—ISTANBUL.—August 22nd. Administration of Posts, Telegraphs and Telephones. 100,000 metres of field telephone cable. (A.X. 11017.)*
ANKARA.—August 23rd. Administration of Posts, Telegraphs and Telephones. Transformers, convertors, switchgear, &c., for the local wireless transmitting station. (A.X. 11036.)*

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Bath.—Electric Light Committee. Recommended:—
Switchgear for the grid system (£10,930).—Ferguson, Pailin, Ltd.

Bexhill.—Electricity Committee. Recommended:—
Apparatus for testing meters (£100).—Edison Swan Electric Co., Ltd.

Birmingham.—Education Committee. Accepted:—
Electric lighting installations at schools.—Fentham Road (£110), Windsor Street (£422), Yardley Road (£133).—Baxter & Impey. Steward Street (£57).—Couzens and Akers, Ltd. Bushmore Farm (£27), Fentham Road (£18), Moseley Road School (£20).—T. Glover. Oldknow Road.—E. Hill & Sons. Selly Park.—Sydney R. Hare & Son, Ltd. Girls' Hostel, Bristol Road (£57).—R. H. Newton.

Bradford.—Electricity Committee. Accepted:—
Elevator and drag link conveyor at Valley Road power station.—Underfeed Stoker Co., Ltd.
Two steam isolating valves.—J. Blakeborough & Sons, Ltd.
Auxiliary switchgear for boiler plant at Valley Road power station.—A. Reyrolle & Co., Ltd.

Grimsby.—Electricity Committee. Recommended:—
Construction of concrete cooling tower (£8,228).—F. Mitchell and Sons, Ltd.
Mangnall-Irving thrust-borer (£265).—Hydraulic Engineering Co., Ltd.

Hailsham.—Rural District Council. Accepted:—
Installation of electric lighting at 18 houses at Sandy Cross (£114).—Strange & Sons, Ltd.

Lamp Contract.—The General Post Office has placed a repeat contract with Siemens Electric Lamps & Supplies, Ltd., for a large supply of lamps for inspection headlamps.

Leeds.—Tramways Committee. Accepted:—
Four 500-kW rotary convertors and equipment for sub-stations (£7,090).—Crompton Parkinson, Ltd.
Electricity Committee. Accepted:—
Switchgear (£707).—New Switchgear Construction Co., Ltd.
Two 750-kVA transformers (£570).—Ferranti, Ltd.
Cable.—W. T. Henley's Telegraph Works Co., Ltd. (£834); Macintosh Cable Co., Ltd. (£850); Edison Swan Cables, Ltd. (£909); Metropolitan Electric Cable and Construction Co., Ltd. (£980).

London.—L.C.C.—Highways Committee. Accepted:—
Transformers for Greenwich power station (£1,323).—Yorkshire Electric Transformer Co., Ltd.
Switchgear for Greenwich power station (£2,179).—Crompton Parkinson, Ltd.
The lowest tender was accepted in each case, the highest submitted being £2,077 and £3,471, respectively.
Central Public Health Committee. Accepted:—
Wiring and fittings for alterations and additions to electric lighting, power and bells, &c., at Sheffield Street Hospital, Kingsway (£285).—Buchanan & Curwen.
STEPNEY.—Electricity Supply Committee. Recommended:—
Lift at Limehouse power station (£632).—Marryat & Scott, Ltd.
Baths and Washhouses Committee. Recommended:—
Synchronised electric clocks at Mile End baths (£118).—Synchronome Co., Ltd.
ST. MARYLEBONE.—Electricity Committee. Recommended:—
Meters for the year ending September 30th, 1932.—Chamberlain & Hookham, Ltd.; Ferranti, Ltd.
ST. PANCRAS.—Contracts and Stores Committee. Recommended:—
Cable (£406).—Siemens Bros. & Co., Ltd.

Manchester.—Transport Committee. Accepted:—
Special trackwork.—Titan Trackwork Co., Ltd.; Edgar Allen and Co., Ltd.
Cadmium copper trolley wire.—R. Johnson & Nephew, Ltd.
Electricity Committee. Accepted:—
6,600-V and 33,000-V switchgear.—Ferguson, Pailin, Ltd.
Electric cookers.—Credenda Conduits Co., Ltd.; Jackson Electric Stove Co., Ltd.
33,000-V transformers, with automatic voltage variation equipment.—Metropolitan-Vickers Electrical Co., Ltd.; Ferranti, Ltd.
Supervisory control gear.—Standard Telephones & Cables, Ltd.
440-V, 3-phase, 4-wire, overhead line, Droylsden.—John Collier & Co. (Electrical Engineers), Ltd.

Morecambe.—Electricity Committee. Accepted:—
Erection of overhead lines to Middleton and Overton (£1,440).—Craven and District Electrical Construction Co., Ltd.

Northampton.—Health Committee. Recommended:—
X-ray apparatus for dispensary (£524).—Schall & Son, Ltd.

Stoke-on-Trent.—Corporation Electricity Committee. Accepted:—
Erection of overhead wiring and services to houses on the High Street estate, Fenton (£116).—Barnett and Soans.

Wrexham.—Rural District Council. Accepted:—
Installation of electric lighting at the fever hospital extensions (£236).—S. Thornton.

York.—Education Committee. Accepted:—
Renewal of electric lighting fittings at Fishergate School (£290).—H. Etherington.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of the makers of the following:—

Separate batten type lampholders for use with striplite lamps.

SPIROVANE pump.

MOTOPUMP.

DAISY vacuum cleaner.

Notes

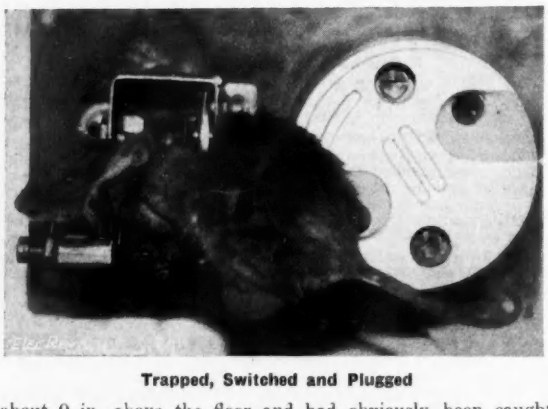
Electrical Association for Women

The Association has organised a second summer school for teachers of domestic subjects on "Electricity Applied to the Home," which is being held this year from July 28th to August 11th, inclusive, at Berridge House, Fortune Green Road, N.W.6. There are three lecturers, Miss Partridge, A.M.I.E.E., Miss Vaughan, and Miss Purvis, assisted by Mrs. Flack, Manufacturers and others are again generously lending apparatus and accessories. In connection with the school, the following visits are to be held: August 4th, St. Marylebone power station; August 5th, Edison Swan Electric Co.'s showrooms in Charing Cross Road; August 10th, Lighting Service Bureau, London.

Through the kindness of Mr. J. H. Parker, M.I.E.E., electrical engineer to the L.C.C. tramways, over 100 E.A.W. members visited the central tramcar repair depôt at Greenwich on July 21st. The party saw how the tramcars were brought in for cleaning and repair; each car is thoroughly overhauled once a year and completely dismantled every two years.

Mice . . . !

While working recently on a job in Regent Street, London, Messrs. Edwin Crook & Co., when tracing some faults, had occasion to remove a switch plug of "M.K." make and discovered a mouse firmly trapped in it as shown below. The animal must have entered the switch box through a ⅝-in. hole



Trapped, Switched and Plugged

about 9 in. above the floor and had obviously been caught almost immediately by someone operating the switch. Was the mouse killed by being practically decapitated, or was the primary cause of death electric shock?

Appointments Vacant

Teachers of electrical science, electrical installation rules and theory for evening classes at Guildford Technical College.

Deputy borough electrical engineer for Stoke Newington.

Mains assistant for Ipswich Electricity Department.

Lady demonstrator for Eccles Electricity Department.

Graduate assistant at Dartford Technical College for Kent Education Committee.

(See our advertisement pages to-day.)

A Theatre "Lighting Director"

The first application in New York of electron tube control of theatre lighting will be made in the new Earl Carroll theatre at Seventh Avenue and Fiftieth Street, which is to be opened in August. The control, especially designed for the new theatre by the General Electric Company of America, eliminates the bulky back-stage switchboard and puts instant and accurate control of all lighting at the finger tips of a lighting director in front of the curtain beside the leader of the orchestra where he can see the effects he produces, allowing more accurate and delicately adjusted effects by mere flicks of small switches. The house will be decorated in black velvet and stainless steel with concealed lighting. One of the novelties will be the use of four colours (red, blue, green, and white) for the "house" and auditorium lighting. There will be 50 incandescent lighting circuits in all, 34 on the stage and 16 in the house, in addition to a large number of arc-lighting circuits. Each incandescent circuit will govern a group of lamps and, in addition, there will be control circuits for the various colours in the groups, governed independently and arranged for unit control from a grand master controller. Some idea of the intensity and variety of the light to be employed is gained from the fact that a total of 367,000 watts is the load of all the incandescent lamps which will be used, of which 231,000 watts will be incandescent on the stage and 136,000 watts will be in the house proper. To these figures must be added the arc lighting for the stage. In spite of the large amount of electricity involved for such a lighting project, the new method of control takes only a maximum of 200 watts, or four watts for each of the 50 pilot-board control circuits. In other words, the control board does not handle very large loads directly, but through the medium of the electron tubes and the reactor system. The control console will resemble a desk with raised sides and back. In approximate dimensions it will be six feet long, five feet high, and three feet deep. The operator, while one scene is taking place, will be arranging the lighting set-up for the following scene, and manipulation of knobs will vary the lighting as required. A "black-out" may be introduced between scenes when desired by a similar operation. The arrangement of the system is as follows: one side of the voltage supply to each light or group of lights will pass through one winding of a saturable-core reactor, its other winding being fed by direct current in varying amounts from a "Thyratron" tube. The amount of rectified current supplied by the tubes will depend on the electrical relationship between the elements of each tube, which, in turn, will be determined by the manipulations of the lighting director. As the amount of direct current fed by the tube to the reactor varies, the impedance of the reactor to the lighting supply load will vary from "lights out" to full brilliancy. By the use of master controls it is possible to govern all the lighting circuits by one knob, or to split the control into major and minor divisions, depending on colour, location, and function, each group in turn being controllable through the agency of a variable resistance.

Travelling Exhibition

A British trade showroom was opened at Cairo on Monday last, and after continuing there for one week it will move on to Alexandria, subsequently proceeding to the Cape. According to *The Times* correspondent at Cairo the enterprise, which has excited a good leal of interest among Egyptians, is the work of the British Africa Industrial Development Expedition led by Mr. Geoffrey Malins. The exhibits in the showroom represent the products of 65 British firms. The travelling under rough road conditions from London without serious trouble has been impressive of the efficiency of British manufactures.

Railway Electrification Criticism

Criticism of the report of the Weir Committee on railway electrification was indulged in by Sir David Milne-Watson, president of the National Gas Council, at the annual luncheon of the Central Executive Board of the National Gas Council.

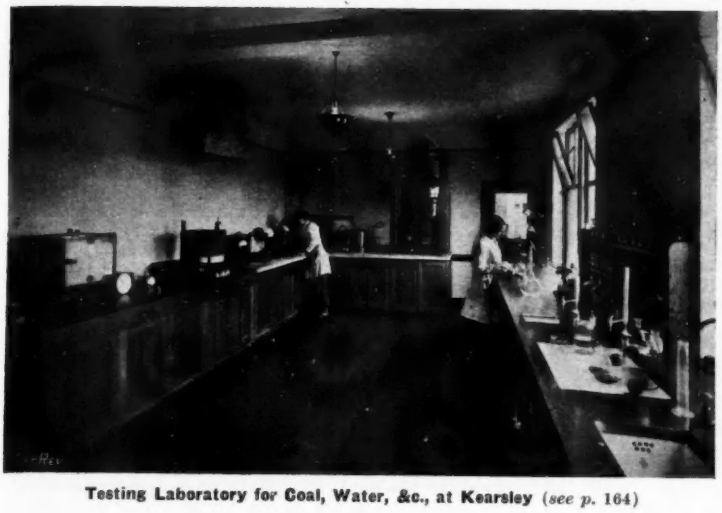
Sir David's strictures were largely based on the difference between the estimates and the results of the national electricity scheme. Last year's report of the Central Electricity Board showed that the Board was faced with an expenditure of about £50,000,000, compared with an estimate of £33,500,000, and much of this increase was due to the fact that, while the original estimate of the outlay on the standardisation of frequency was £8,000,000, the revised figure was £16,300,000.

"Having regard," said the speaker, "to the disparity between the estimated and actual expenditure on the one hand, and the estimated and actual demand for electricity on the other hand, can we place any more confidence in the estimates contained in the new railway electrification report? Could the contention that railway electrification would assist industry generally by cheapening electricity be justified? In this country to-day it was being supplied at lower rates than in many foreign countries. The power costs in industry, in the great majority of cases, formed only a negligible proportion of the cost of the manufactured article. No definite steps should be taken to spend such a vast sum unless it could be proved up to the hilt that it was going to improve and cheapen railway transport. Immediately the report of the Committee on main-line railway electrification was published they had it examined in order to ascertain its probable effect upon their industry. They found nothing in the report to justify any hope of their transport costs being reduced, nor, indeed, any prospect of any reduction in transport charges generally. Every one was more or less agreed on the advisability of the electrification of the suburban lines, but the question before the country was main-line haulage, and, therefore, it was difficult to see wherein lay the advantage of electrification. The possible saving was extremely shadowy, and a very small error would turn this problematical saving into a definite loss. The estimated saving by itself would not appear from a business point of view to warrant the adoption of a scheme of such exceptional magnitude."

Sir Arthur Duckham also spoke, and said he had never felt as a main-line railway passenger or as one interested in the efficiency and low cost of mineral transport that electrification would bring any benefit.

E.h.p. Interconnection Scheme

Adding 75,000 kW to the power facilities of the San Joaquin Light & Power Corporation's system, its new sub-station at Herndon, about ten miles north of Fresno, Calif., was, according to *Power*, placed in operation last month. From this sub-station a 100-mile, 220-kV. transmission line has been built to Bellota, where it ties in with the Pacific Gas and Electric system. From Bellota the line extends to the Wilson sub-station, using the steel towers of the present 220-kV Sacramento-Merced line erected by the Great Western Power Company. This interconnection makes available to the San Joaquin system electric power from both the hydro and steam-electric power from the new plants at San Francisco.



Testing Laboratory for Coal, Water, &c., at Kearsley (*see p.* 164)

Two-way Switching

Their interest in anything which has reference to convenience in circuit controls for lighting has prompted A. P. Lundberg & Sons, Ltd., to comment upon the note headed "Wiring for Two-way Switches" on page 88 of our July 17th issue. While quite in agreement with most of the author's remarks, they disagree with that which states that the alternative method of two-way wiring shown in the lower diagram is but little known, for they included this circuit in the first edition of their booklet on "Lektrik Lighting Connections" published in May, 1912, and since then it has appeared in later editions in an amplified form. As some 85,000 copies of this booklet are in circulation, the circuit should be well known by now. This method was also described in their book on "Small Switches, &c., and their Circuits" by the late W. Perren Maycock, M.I.E.E., which was published in September, 1911, so that next year this circuit will be celebrating its majority.

Should extra points of control be required, such provision can be made by the insertion of "pivot intermediate" switches, but the "common" terminals of the two end two-way switches still require to be connected together, independently of the intermediate switches intervening.

The First 10,000-V Cable

We have received an interesting extract in pamphlet form from a book entitled "Electric Light Cables" by the late Mr. Stuart A. Russell, describing in detail the design of the first 10,000-volt cable, which was made by the late Dr. S. Z. de Ferranti in 1890, some of which is still in use in London at the present time. As the book is out of print and very few copies of it seem to be in circulation, readers interested in the subject can obtain copies of the pamphlet from Mr. J. H. C Brooking, Croydon Cable Works, Ltd., Mitcham Road, Croydon, Surrey.

St. Helens Extensions

One of the most pleasing incidents in connection with the official opening of the extension of the St. Helens electricity works on July 22nd (see page 139 of our July 24th issue) was the presence of the three past electrical engineers of the borough, Messrs. Robert Lee (now borough electrical engineer of Stockport), E. M. Hollingsworth (now electrical engineer, Imperial Chemical Industries, Ltd.), and F. N. Rendell-Baker (now electrical engineer at Croydon). The fact was commented upon by Mr. Robert Blackmore, district engineer of the Central Electricity Board, at the luncheon which followed the switching in of the new plant.

Sir Peter Peacock, chairman of the Warrington Electricity Committee, jocularly wondered how St. Helens managed to get over the Central Electricity Board to secure the new plant. Although they had been promised cheaper electricity from the grid, no one seemed to know how that was going to be brought about. Warrington would certainly consider herself lucky if she could get current cheaper than she was now paying for it.

Councillor J. Morton, chairman of the Stockport Electricity Committee, paid a generous tribute to Mr. W. Shawhill Johnston, the St. Helens borough electrical engineer, one of a long line of engineers who had served the town truly and well.

Alderman J. Hewitt, chairman of the St. Helens Electricity Committee, said it was hoped within the next few months to open new electricity showrooms in the town. In the last few years they had gone beyond the confines of the town in supplying electricity, and it was now the job of the Corporation to get as many consumers as possible to fill up the load curve. When St. Helens got back to pre-war prices no one would have any justification for complaint.

Mr. Robert Blackmore (Central Electricity Board) explained that the plant which formed the extension was ordered by himself for another station, but, as the other people were not ready to receive it, St. Helens was allowed to commandeer it. It was fashionable to-day to doubt what the grid system was going to do in this country, and he was indeed surprised to hear the chairman of the Warrington Electricity Committee cast doubts on the hopes of the Board with regard to prices. Personally, he was very optimistic as to what could be achieved. One of the main factors in the industrial developments in the south had been cheap electricity supplies; he believed industry would have the same help in the north. If manufacturers would only set out their processes on a seasonal basis, when the grid scheme was in full operation it would be possible for St. Helens and other authorities to supply electricity as low as one-fifth of a penny per kWh. There was a fount of electricity available nine months of the year, 250,000 kW, that could be sold at that price. The grid would render that supply available. Subject to the load in the north-western area increasing, and that was the real crucial matter, he could say quite definitely that the price of electricity to the undertaker would generally be less than if the undertaker were to generate it himself. Mr. A. C. Cramb also replied.

Other brief and felicitous speeches were made by Mr. J. S. Peck (Metropolitan-Vickers Electrical Co., Ltd.), Mr. W. Bayliss (Babcock & Wilcox, Ltd.), and Mr. W. S. Johnston (St. Helens borough electrical engineer).

A Word for the "Pylons"

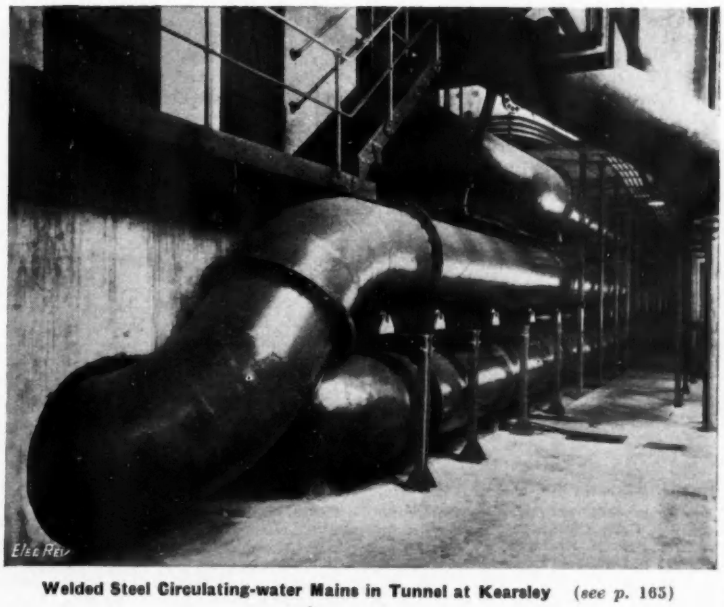
Amid the chorus of disapproval which the erection of the grid towers (miscalled "pylons") has raised, it is comforting to hear the voice of a "truly rural villager" sounding their praises. Mr. W. M. Clarke, in a letter to *The Times* says: "Amidst all the carping criticism showered on the new electric pylons which are spreading all over the country, may a truly rural villager put in a word of praise for them?

"Compared with the stolid, bulky uprightness of the telegraph pole, the airy lightness of the pylons adds a romantic touch to the dullest landscape. In the dusk they look like long rows of the ghosts of Euclid's problems, marching over hill and dale, till they vanish into the land of the fourth dimension. The beauty of geometrical symmetry is theirs, and the pendant bunches of insulators have an effect as of Chinese lanterns, a suggestion of pagodas and Eastern landscapes mingled with memories of childhood's first vision of Kew Gardens.

"If the distribution of electric power is to result in practical benefits to ordinary people, let us be fair and acknowledge that at least as great a care for the beauty of the countryside is shown in these as in the telegraph and telephone posts and wires. Could power be carried more finely? If so, let us have the great design!"

I.M.E.A. Convention, 1932

The Incorporated Municipal Electrical Association announces that its thirty-seventh annual convention will be held during the week commencing June 13th, 1932.



Welded Steel Circulating-water Mains in Tunnel at Kearsley (*see p.* 165)

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. Arthur E. Hadley, who has succeeded the Marquess of Winchester as chairman of the Victoria Falls and Transvaal Power Co., Ltd., presided at last week's annual meeting of the company which is reported in our City Notes. Mr. Hadley, who was born in 1870, occupied the position of Assistant Controller of the Inspection Department, Ministry of Munitions, during the war, and his services were recognised in 1918 by the award of the C.B.E. He has been a member of the Institution of Electrical Engineers since 1913, having been elected an associate in 1895. His paper on "Power Supply on the Rand" (ELEC. REV., March 28th, 1913, *et seq.*) secured for him the Institution's premium in 1913. Mr. Hadley has been managing director of the Victoria Falls Company for many years; he now combines that position with the chairmanship of the company.

Mr. Bernard Price, general manager and chief engineer of the company in South Africa, has been elected to the board.

Mr. Theodor Petersen was the guest of honour at a luncheon given at the Waldorf Hotel on Monday last to celebrate his appointment as assistant managing director of Callender's Cable and Construction Co., Ltd., and director of the Anchor Cable Co., Ltd. His total service with the company is 36 years. To mark the occasion, Mr. Petersen was presented with his portrait and an album containing the names of 801 subscribers. We reproduce herewith a photograph of the portrait and album.

Portrait and Album presented to Mr. Theodor Petersen, of Callender's, on Monday last

Mr. Sam Mavor, managing director of Messrs. Mavor & Coulson, Ltd., Glasgow, has accepted an invitation to serve on the Scottish National Development Council.

Lord Rutherford, Sir Charles C. Sherrington, and **Sir Joseph J. Thomson** are to receive the degree of Doctor of Science, *honoris causa*, from the London University upon the occasion of the centenary meeting of the British Association in September, states *The Times*.

Sir Richard Glazebrook has been appointed chairman of the Advisory Council of the Science Museum by the President of the Board of Education, in succession to the late Sir Hugh Bell.

Mr. Arthur Dorman has been elected vice-chairman of Dorman, Long & Co., Ltd.

Mr. W. J. Forster, of Stoke Newington, has been appointed mains superintendent in the Rawtenstall Electricity Department, in succession to Mr. J. E. Shepherd, who was appointed electrical engineer in January last.

Mr. A. F. Brown, of Rumney, has been appointed engineer-in-charge of the Hackney power station. Mr. Brown was with the Anglo-Persian Oil Co., at Abadan, Persia, for 10 years as electrical engineer.

Mr. G. W. Malcolm, M.B.E., who has just been appointed chairman of the British Power and Light Corporation (1929), Ltd.

Mr. George W. Malcolm, whose appointment as chairman of the North Wales Power Co., and the British Power and Light Corporation (1929), Ltd., is announced, is a mechanical and electrical engineer and a member of both Institutions. He was born in 1870 and after studying mechanical engineering, entered the service of the Pacific Steam Navigation Co. For nine years, until 1907, he was engaged in engineering in Mauritius and then joined the Salt Union, Ltd., as chief engineer. He was appointed joint managing director of that company in 1913. As chief engineer of the company he originated the supply of electricity as a by-product and for this purpose the Mersey Power Co. was formed in 1911. Mr. Malcolm is chairman and managing director of this company.

Mr. T. Davies has been appointed superintendent of the Prince Rock station by the Plymouth Corporation Electricity Committee, at a salary of £510 per annum.

Mr. R. C. Phillips, son of Mr. R. W. L. Phillips, borough electrical engineer at Bedford, and a member of the technical staff of Lever Bros., Ltd., at Apapa, West Africa, was married on July 18th to Miss Marjorie Fell, of Bebington.

Mr. A. G. H. Oxley, formerly district engineer and manager in the Midland area for Electrical Control, Ltd., has joined the Birmingham office staff of Messrs. Crompton Parkinson, Ltd., as switchgear specialist.

Obituary

Mr. Arthur Wright.—The electrical industry lost another pioneer this week by the death of Mr. Arthur Wright at the age of 73. He is remembered principally for his introduction of the maximum demand system of charging for electricity. This was instituted at Brighton, of which town Mr. Wright was the first electrical engineer. The system was fully described by the late Mr. W. Perren Maycock in the ELECTRICAL REVIEW of February 28th, 1896, in the course of an article describing the (at that time) elaborate electric lighting system which was being installed in Brighton. It was a splendid tribute to Mr. Wright's energy that the author paid when he said that Brighton had more consumers per thousand of population than any other large town in Europe. Under the maximum demand system employed, the average cost of electricity for lighting was under 4½d. per kWh, proving that "electricity is pre-eminently the poor man's light and that poor districts pay just as well as rich ones (if not better)." Mr. Maycock also made reference in the same article to the system adopted of raising the distribution pressure at times of heavy load.

A week later (March 6th, 1896) we reported the formation of the Municipal Electrical Association (now the I.M.E.A.), following upon a suggestion made by Mr. J. H. Rider some time previously. Mr. Arthur Wright was the first president; the vice-presidents were Messrs. W. Arnot and C. H. Wordingham; the committee members were Messrs. C. S. Vesey-Brown, A. Gay, J. Hesketh, A. B. Mountain; H. Faraday Proctor, and J. H. Rider; while Mr. W. L. Maqden was hon. secretary. At the first convention in the following June, Mr. Wright not only delivered a presidential address; he also read a very useful paper on "The Cost of Electricity Supply" in which expenses were analysed between standing and running charges, with a view to evolving an equitable method of charging for energy supplied. He laid down a set of twelve "far-reaching conclusions" in which the general principles of electricity usage and charging were clearly expounded. After a quarter of a century at Brighton Mr. Wright retired from the position of borough electrical engineer and established a consulting practice in London. He then "retired" but was soon at work again; and, among other things, acted as consultant to the Boston Edison Company, a connection which he maintained up to about three years ago. He joined the Institution of Electrical Engineers as an associate in 1882; he became an associate member in 1899 and a member in 1902.

Mr. H. H. Duff.—The death is reported of Mr. Henry H. Duff, late of the Western Telegraph Co., Ltd. He was 52 years of age.

Herr S. Schneider.—The death recently occurred at Sornewitz, Germany, at the early age of 52 years, of Herr Stephan Schneider, a leading German authority on electric cooking and water heating appliances.

Mr. R. H. Polgrahan.—We regret to hear from the Edison Swan Electric Co., Ltd., that Mr. Rex Polgrahan, of the company's Bristol staff, lost his life at Le Zoute, Belgium, on July 21st, while assisting in the rescue of a drowning woman. His body was not recovered until the following day. His remains, covered with the Union Jack and floral tributes from the Burgomaster and local residents as well as from relatives and his "Ediswan" friends, were interred with civic honours in the English Cemetery at Le Zoute on Friday last.

Lord Knutsford.—Viscount Knutsford, who passed away at the age of 76 on Monday last, and earned the title of "Prince of Beggars" by his efforts in raising money for the London Hospital, was a director of the Underground Electric Railways Co. of London, Ltd.

Mr. T. P. Gaylord.—An American exchange records the death, which occurred suddenly on July 5th at the age of 60 years, of Mr. Truman P. Gaylord, vice-president of the Westinghouse Electric and Manufacturing Co., East Pittsburgh. He was working as an engineer for the Chicago World's Fair Company in 1892, and subsequently became assistant professor of electrical engineering at the Armour Institute. Service followed with the Chicago Edison Company. In 1899 he became identified with the Westinghouse Company and thirty years later was elected to the vice-presidency of that concern.

Will.—Mr. Herbert Morris, the late chairman of Herbert Morris, Ltd., Loughborough, left estate valued at £102,843 gross (£100,928 net personalty).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Universal Contracts (Electrical), Ltd.—Private company. Registered July 18th. Capital, £11,000 in 200,000 ordinary shares of 1s. each and 1,000 8 per cent. redeemable preference shares of £1 each. Objects: To adopt an agreement between P. Miglio of the first part, the Greater Britain Investment Trust, Ltd., of the second part, and the company of the third part, novating and assigning an agreement dated July 2nd, 1931, between P. Miglio and Greater Britain Investment Trust, Ltd., to develop and turn to account the trading rights as to the supply and purchase of raw material respectively referred to and the assets comprised therein; to acquire, sell and trade in all raw materials and necessary articles for the manufacture of electric lamps, electrical and other apparatus, &c. The directors are: R. P. Wilson, 89, Piccadilly, W.1, consulting engineer; J. Soetewey, 207, Avenue de Belgique, Antwerp; A. S. Sinnatt, 75, Rutland Road, Ilford; W. E. Martin, The College, Maidstone, Kent. Secretary: S. H. Cary, 3-4, Clements Inn, W.C.2.

Williams & Maddox, Ltd.—Private company. Registered July 23rd. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electric, gas and oil lamps, quartz lamp, lamp standards, reflectors, bells, fires, stoves, &c. The directors are: W. R. Williams, 32, Cambridge Place, W.2; E. H. Maddox, 18, Nethercourt Avenue, Finchley, N.3. Solicitors: Griffinhoofe & Brewster, 3, Kings Bench Walk, Temple, E.C.

Automatic Safety Indicators, Ltd.—Private company. Registered July 24th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in motor car accessories (electrical or otherwise), &c. The directors are: S. Cohen, 16, Mayfield Gardens, Hendon; A. de Groot, 20, Clifton Gardens, N.W.; M. Zimmer, Furth, Bavaria. Secretary S. Cohen. Registered office 14, Bunhill Row, E.C.1.

Southsea Radio Exchange, Ltd.—Private company. Registered July 22nd. Capital, £250 in £1 shares. Objects: To carry on the business of manufacturers of, agents for and dealers in radio apparatus, gramophones, &c. The directors are: T. E. Underdown, 52, Belmont Street, Southsea; E. A. Rogers, 30, Francis Avenue, Southsea.

Returns of Electrical Companies

Bond Wholesale Electrical Co., Ltd.—Debenture dated July 15th, 1931, to secure £400, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: H. W. Aires, 17, Sandhurst Road, Leicester.

Burnham and District Electric Supply Co., Ltd.—Satisfaction to the extent of £1,000, on June 11th, 1931, of debenture dated March 2nd, 1920, and registered March 10th, 1920. (According to the register of mortgages, the debenture registered March 10th, 1920, originally secured £3,000.)

Campbell and Addison, Ltd.—Issue on July 10th, 1931, of £100 debentures, part of a series already registered.

G. H. Bond, of 3, London Wall Buildings, E.C.2, was appointed receiver on July 20th, 1931, under powers contained in trust deeds dated May 20th, 1930.

Celestion, Ltd.—Debenture dated July 14th, 1931, to secure £5,000 and a bonus of £250, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Oxford Trust, Ltd., 72, Oxford Street, W.1.

Chipping Norton Electric Supply Co., Ltd.—Satisfaction to the extent of £6,000 on July 11th, 1931, of mortgage or charge dated May 16th, 1923, and registered May 18th, 1923.

Consolidated Signal Co., Ltd.—Capital, £425,000 in 220,000 preference and 205,000 ordinary shares of £1. Return dated February 10th, 1931. 214,195 preference and 150,548 ordinary shares taken up. £52,839 paid on 24,999 preference and 27,840 ordinary shares. £311,904 considered as paid on 189,196 preference and 122,708 ordinary shares. Mortgages and charges, nil.

Crampton & Co., Ltd.—Capital, £2,500 in £1 shares. Return dated February 23rd, 1931. All shares taken up. £2,500 paid. Mortgages and charges, nil.

Devereux, Ltd.—Agreement by way of further charge on the company's undertaking and property, present and future, including uncalled capital dated July 9th, 1931, to secure £65. Holder: B. H. Roach, 4, Copthall Buildings, E.C.2.

Energy Syndicate, Ltd.—Capital, £25,000 in 12,000 preference and 13,000 ordinary shares of £1. Return dated December 31st, 1930 (filed March 24th, 1931). 111,972 preference and 12,724 ordinary shares taken up. £24,696 paid. Mortgages and charges, nil.

Harmonic Radio Co., Ltd.—W. Clayton, Milton Chambers, Milton Street, Nottingham, was appointed receiver and manager on July 13th, 1931, under powers contained in debenture dated April 15th, 1930.

Ramsay, Jackson & Co., Ltd.—B. J. Davis, 2, Norfolk Street, Strand, W.C.2, ceased to act as receiver on July 10th, 1931.

John A. H. Hunt, Ltd.—Issue on July 14th, 1931, of £150 debentures, part of a series already registered.

Lancashire United Transport & Power Co., Ltd.—Capital, £200,000 in £1 shares. Return dated March 11th, 1931. 192,878 shares taken up. £7 paid, £192,871 considered as paid. Mortgages and charges: £238,941 6 per cent. first mortgage debenture stock, £296,500 5 per cent. second mortgage debenture stock, and £83,330 deferred debenture stock (having no charge over company's assets).

Leamington and Warwick Electrical Co., Ltd.—Capital, £100,000 in 2,500 preference and 7,500 ordinary shares of £10. Return dated February 27th, 1931. All shares taken up. £100,000 paid. Mortgages and charges: £35,000.

London Electric Supply Corporation, Ltd.—Satisfaction to the extent of £587,355 on June 8th, 1931, of mortgage or charge dated August 18th, 1898, and registered January 23rd, 1902, securing a sum not exceeding half the nominal share capital of the company.

Sun-Ray Electric Lamp Co., Ltd.—E. Morter, "Woodlands," Woodlands Avenue, Hornchurch, was appointed receiver and manager on July 6th, 1931, under powers contained in first debenture dated October 9th, 1929.

City Notes

Victoria Falls and Transvaal Power Co., Ltd.

The accounts of this company were abstracted in our issue of July 10th, p. 74, and the annual meeting was held on July 23rd. Mr. A. E. Hadley (chairman and managing director), who presided, said in the course of his speech that the work which they undertook of constructing and financing the Witbank power station had been completed, and there was at the end of last year only a few hundred pounds outstanding in respect of the expenditure of over 1¼ million pounds incurred by them on behalf of the Electricity Supply Commission. The last extension of the Witbank station, although carried out by them, was financed by the Commission. The electrical plant at this station, representing 100,000 kW of capacity, was now completed. The gold mines took over 96 per cent. of their output and the remainder was also largely dependent upon the continuance of the mining industry. With the steady growth in the sales of electrical energy, they were able to reduce the prices from the commencement of 1930 by accelerating the annual reduction which would have taken place during the next four years as the loan capital was retired. In doing this the company had in view the object of stabilising and expanding the business in which it was engaged, and at the same time of assisting the continuous efforts of the mining industry to bring more ore into the pay zone and to prolong the life of the reef. The two large turbo-generators which formed the principal part of the last extension programme, one of 32,500 kW at Vereeniging and one of 20,000 kW at Brakpan, had been in commission for sometime, and the new electrically-driven air station at Canada Dam would start later in the year. The demand by consumers on the power stations was now 216,000 kW, and the demand for power in the form of compressed air was 48,000 kW. To drive this installation of electrical and compressed air plant involved the purchase of about 2,000,000 tons of coal annually. The weight of compressed air delivered to consumers was also 2,000,000 tons per annum. During the period under review the load and the additional orders for power still required had increased considerably and had come on faster than was anticipated, while further probable demands had been forecast as likely to become definite requirements in the future. To meet these increases of business a further large extension programme was now in hand comprising two generating sets of 32,500 kW each, with boilers, a new transmission line from Vereeniging to the Eastern Rand, together with the necessary transformers and switchgear at distribution stations and consumers' sub-stations. All this plant would be supplied by British manufacturers. The forecast of requirements indicated that still further plant would be needed to meet the ultimate load, and further predicted that the maximum demand would not be reached for some years, and that they would be supplying a load at least equal to the present supply for many years to come. To provide for the cost of these extensions a large part of the cash resources of the company was already earmarked for re-investment in the business. The subject of the rights at the Falls had been fully reviewed at past meetings, and, although they kept in constant touch with the Government of Northern Rhodesia, there was nothing specific to report at present. The gold mining industry had escaped the slump which had damaged almost every other form of enterprise, and the production on the reef for 1930 was a record. They, being concerned with the supply of power to the gold mines, had also been fortunate in continuing its expansion, and there was nothing to lead them to anticipate any sudden setback. A staff pension fund was inaugurated in January last. Lord Winchester had left the board, and Mr. Bernard Price, general manager in South Africa, had been elected a director. The report and accounts were adopted.

Cables-Wireless Merger Reports

The revenue account of Cables and Wireless, Ltd., for 1930, shows that the dividends receivable from constituent companies amounted to £1,386,875, while the profit, after payment of general expenses, interest, &c., amounted to £1,302,385, as compared with £1,327,311 for the previous period of 21 months, to which is added £64,257 brought forward, making £1,366,642 available. This has been applied as follows: Dividend for 1929 on preference stock issued since December 31st, 1929 (£10,787); writing off formation expenses (£15,108); dividend on preference stock for 1930 (£1,273,840); carried forward £66,907.

The accounts of Imperial and International Communications Ltd., relate to the first completed year of the unified direction

and control of the undertaking, this control at December 31st last having been in operation for 15 months. For 1930 the profit amounted to £326,248, as compared with £2,023,155 in the 21 months to December 31st, 1929. The decrease is at the rate of £829,840 per annum, and may be entirely attributed to the fall in message receipts. These have diminished by £992,183 per annum, as compared with the average during the first 21 months of the company's operation. The greater part of the profit of £326,248 was earned during the first five months of 1930. Economies have been effected resulting in a saving of £195,000, and the expense and maintenance of cables has been reduced at the rate of £91,000 a year. The personnel has also been reduced by 1,588, with a consequent saving in salaries and allowances of £370,000 per annum. At the forthcoming annual meeting the stockholders of Cables and Wireless, Ltd., are to be asked to sanction the payment of £1,500, as compensation for loss of office, to each of seven directors who voluntarily resigned in December. A dividend of 1¾ per cent. is being paid on the shares of the Communications Co., and £200,000 transferred to general reserve last year is to be used for this purpose. The report refers to the trade position and states that the economies effected will enable the company to take advantage of an improvement in trade when it occurs. Reductions in rates have been made, but the resultant decrease in revenue cannot be made up until there is a recovery in trade. In addition to the radio-telegraph service between London and Teheran, new wireless services were opened by associated companies during 1930 between Spain and Mexico, Holland, and the Philippines, between Portugal and Holland, and between Argentina and Great Britain. During the present year associated companies have opened new wireless services between Austria and the United States, between Argentina and Holland and Belgium, and radio-telephone services between Argentina and Australia, and between Rio de Janeiro and Great Britain. Direct through cable working has recently been established between London and Rio de Janeiro, Buenos Aires, Adelaide, Hong Kong, and Hamburg.

As a result of discussions with the Advisory Committee the court of directors has come to the conclusion that nothing short of very "drastic measures" can permanently restore health to the Communications system. It is hoped that an announcement of the decisions arrived at will be made shortly Reference is made to the serious position created by the increasing competition through the opening by governments of direct wireless services.

The traffic receipts of Imperial & International Communications, Ltd., for June amounted to £374,502, making the total for the first six months of the current year £2,383,949, as compared with £2,807,723 for the corresponding period of last year.

Companies to be Struck Off the Register

The names of the undermentioned companies will be struck off the Register at the expiration of three months unless cause is shown to the contrary: National Electric Lamp Co., Ltd.; Wax Electric Light Tube Manufacturing Co., Ltd.; Wilson-Wolf Engineering Co., Ltd.; Comparri Wireless Control Syndicate, Ltd.; Electrical Units, Ltd.; Fylde Electric Co., Ltd.; Knivetown Electric Wire Co., Ltd.; Néon Lights (1923), Ltd.; and Saunders Electrical Co., Ltd.

The American & Foreign Power Co. reports that the net revenue for 1930 from the operation of subsidiaries amounted to $39,719,983, as compared with $32,181,556 for 1929. The net amount available for common stock outstanding was equivalent to $1.04 per share, as compared with $4 per share at December 31st, 1929. Details of the continued expansion in the twelve countries in which it operates show that a further 91 communities were added during the year to the company's sphere of operation. A satisfactory symptom, offsetting to some extent adverse business conditions, has been the increase in the domestic electrical demand, household appliance sales during the year showing an increase of 39 per cent. over 1929.

The Nigerian Electricity Supply Corporation, in its report for the year ended February 28th last, shows a profit of £17,524. After deducting £898 for taxation, the balance of £16,626 is carried forward. A supply was commenced in June, 1930, and a permanent supply was available for the tin mines by the end of October. Special rebates in the price of power supplied were temporarily given to consumers in order to deal with the acute position which arose in the tin-mining industry.

The Metropolitan Railway Co. has announced an interim dividend of 1 per cent. on the consolidated stock, as against 1½ per cent. last year. The directors state that in declaring a reduced interim, they have to take into consideration the increased amount of debenture interest payable and the costs incurred by the company arising out of the London Transport Bill. The interim dividend on the surplus lands stock is maintained at 1½ per cent.

The Eastern Telegraph Co., Ltd., reports a gross revenue of £505,543, which includes dividends from Imperial and International Communications, Ltd., and other associated and subsidiary companies. To the income is added £28,000 provided in the previous year to cover losses on sale of investments. The directors recommend a dividend of 7 per cent. on the ordinary stock, against 7¾ per cent., the carry-forward being £595.

The West India & Panama Telegraph Co., in its report for 1930, shows a revenue of £44,603, as compared with £59,950 in the preceding year. Expenses were £60,603 (against £79,998), leaving a debit of £16,001 (£20,049). After providing for debenture interest, and placing £7,349 to reserve for cable renewals, the debit at profit and loss account carried forward is increased by £27,805 to £207,939.

The Western Union Telegraph Co. reports that the gross revenues, including dividends and interest, for the six months ended June 30th last, amounted to $57,749,031, as compared with $68,886,812 for the corresponding period of 1930. The total expenses were $50,725,162 (against $61,588,259), and after deducting interest on bonded debt, the net income was $4,345,211 ($4,930,320).

The Cork Electric Supply Co., Ltd., shareholders, at a meeting held on July 17th, confirmed resolutions providing for the voluntary winding up of the company with Mr. A. Clements, Crown House, Aldwych, W.C.2, as liquidator; and for the provision of a sum of £18,700 as compensation for the directors and certain officials of the company for the loss of their respective offices.

The Peterborough Electric Traction Co., Ltd., shows a gross profit of £88,999 for 1930 (against £79,074 in 1929). After meeting all expenses, including debenture interest, placing £14,000 to renewals account, and adding £5,551 brought forward, there is a balance of £4,241 available. The preference dividend is paid and £2,921 is carried forward.

The Wemyss and District Tramways Co.'s report for 1930 shows a loss of £811, less a credit balance of £22 brought forward. After meeting debenture interest, &c., the debit carried forward is £3,444. The report states that the tramway receipts were affected by omnibus competition.

Crompton Parkinson, Ltd., have declared the dividends for the six months ended June 30th last on the 8 per cent. cumulative first preference shares and the 6 per cent. cumulative second preference shares.

The Underground Electric Railways Co. of London, Ltd., holders of the 6 per cent. first cumulative income debenture stock have passed a resolution agreeing to the exchange of their present holdings for Transport Board stock.

The Charing Cross Electricity Supply Co., Ltd., has declared an interim dividend on the ordinary shares of the West End undertakings for the half-year ended June 30th last at the rate of 9½d. per share, less tax.

The Dublin United Tramways, Ltd., is not paying an interim dividend on the ordinary shares. No interim dividend was paid last year, but there was a final payment of 3 per cent.

Consolidated Gas Electric Light & Power of Baltimore has announced a dividend of 90 cents per share for the quarter ending September 30th.

Mather & Platt, Ltd., have declared an interim dividend of 2½ per cent., less tax, on the ordinary shares (against 5 per cent. in 1930).

The Telephone and General Trust is paying the interim dividends on the 7 per cent. cumulative preference shares and the 7 per cent. non-cumulative preferred ordinary shares.

The South Metropolitan Electric Light & Power Co., Ltd., has declared an interim dividend of 3 per cent., less tax, on the ordinary shares.

The Westminster Electric Supply Corporation, Ltd., has announced an interim dividend of 8d. per share, less tax, on account of the standard dividend on the ordinary shares.

Enfield Cable Works, Ltd., have declared an interim dividend of 10 per cent. actual, less tax, on the ordinary shares (same).

Stocks and Shares

TUESDAY EVENING.

POLITICS and finance continue to struggle for supremacy in the business world, and the result approaches something akin to deadlock in Stock Exchange markets. Heavy falls have taken place in gilt-edged stocks, last week's rise in Bank Rate to 3½ per cent. having no immediate effect upon a drain of gold in the direction, mainly, of France. The flatness of British Government securities became communicated to investment issues of every class. It spread depression over industrial shares that are not influenced, in the ordinary way, by Money Market factors. It increased the pressure previously experienced upon what little investment and speculative initiation remained. Here and there throughout the Stock Exchange are cheerful spots, but the financial Diogenes requires a high-powered electric lamp as he runs about searching for them.

Cables and Wireless

The anxiously-awaited reports of the Cables & Wireless Company and of the Imperial & International Communications Company are now published, for presentation to the annual meeting called for Thursday in this week. Cables & Wireless is the holding company with 52½ million pounds of issued capital. The I. & I. is the operating company. The latter made a profit for 1930 of £326,248, equal to a decrease in the profit for the previous twelve months (ended December, 1929) at the rate of £829,000 per annum. Economies have been introduced, and the expense of maintenance has been reduced, but the crux of the matter lies in the correlation between the company's traffics and the trade of the world. The board declares that nothing short of very drastic measures can permanently restore health to the Communications system. Reading between the lines, some of the Cables & Wireless shareholders are inclined to ask whether this is a direct hint to the Government that Post Office competition must cease, or, if the Merger is to remain in business, a subsidy is needful. At the meeting on Thursday in this week, there may be plainer speaking than the reports convey. The decline shown by the June figures is the least of those published this year, and from this a negative consolation has been derived.

From the Stock Exchange point of view, prices of the various stocks are lower, but business did not actively develop as a result of the reports, the shareholders evidently preferring to await the upshot of the meeting. The Marconi meeting was called for the day previous. American Telephone & Telegraph is a point lower at 182 and Internationals are 2½ down at 30½. United River Plate Telephone shares, at 4½, have gained half-a-crown.

Home Railway Stocks

The Metropolitan Railway disappointed the optimists by declaring a dividend of 1 per cent., actual, as compared with 1¼ per cent. a year ago. The price gave way to 44½. Districts at 62½ and Underground Electrics at 20s. are both ex dividend; allowing for the deductions, the quotations show no change. The London & North Eastern, in signifying its willingness to undertake a large scheme of electrification, implies that the raising of the necessary capital may call for the assistance of the Government. The Southern Railway figures for the half-year ended June 30th allow for the payment of an interim dividend of 1½ per cent. on the preferred stock; the full half-year's dividend is 2½ per cent. Home Railway stocks are heavy, as a whole, upon the dividend announcements which form a melancholy mirror to industrial depression firstly; and, secondly, to the keen competition of road vehicles.

Electricity Supply

Charing Cross ordinary improved to 31s.: beyond this no change has occurred in the list of Home Electricity Supply shares. The falls in stocks of the gilt-edged group have had no more than a sentimental influence upon electricity shares. It may be that County of London ordinary are a shade easier, but the decline is too insignificant for this to be represented in the official quotation. Provincials are mostly firm. Yorkshire Electric ordinary, at 31s. 3d. ex dividend, have recovered the dividend. Richmond (Surrey) keep hard at 41s., Northamptons are easier at 39s. Electrical Distribution of Yorkshire recovered the deduction at 31s. 3d. ex dividend. The last-named company's new shares stand at 6s. 6d. premium. Isle of Thanet ordinary are 18s. 3d. and the 6 per cent. preference 23s. 3d Atlas ordinary reacted a trifle to 17s. 9d., the preference, at 24s. 9d., showing no movement. British Power and Light are equally motionless at 9s. Calcutta Electrics fell to 33s. Madras Electric at 25s., and Delhi Electric Supply and Traction at 27s. 6d., have been somewhat dull. The uncertainties in Burma have had little effect upon Rangoon Electric Tramways 6 per cent. preference, the price being called 19s. 4½d.

The tale of interim dividends in the group of London electricity supply companies is now virtually complete. Seven of these were set out in last week's ELECTRICAL REVIEW, on page 153. They were all in accordance with expectations previously formed. As the final dividends are thought likely to repeat the figures of six months ago, nothing of particular interest, in regard to dividend distributions, is to be looked for until this time next year.

Automatic Telephones

Holders of Automatic Telephone shares have been reminded that the offers of the International Automatic Telephone Company expire on the Thursday in this week. The surmise may be ventured that tardy proprietors will receive consideration if they happen to have overlooked the matter, and who want to accept one or other of the offers made by the International Company.

Manufacturing and Equipment

The shares of Associated Electrical Industries, Ltd., and the General Electric Co., Ltd., which are watched as likely to reflect New York financial tendencies, are unchanged at 20s. and 40s., respectively. Both are £1 shares. The Associated Company paid 6 per cent. and General Electric 10 per cent. dividends for the past year. Siemens are a weak market; the ordinary have gone back to 20s. 9d. Telegraph Constructions failed to rally from their fall to 11. Henley's gave way to 5½. At this price, the yield on the money, calculated upon the last-paid 30 per cent. dividend, comes to £5 14s. 3d. per cent. British Aluminium have lost a few pence, receding to 27s. 6d. Edison Swan first preference are 6d. down at 23s. 3d. A rise of 1/16 lifted Crompton Parkinsons to 18s. 9d. There is not much business going on in any of these shares. Electric Construction 6 per cent. debenture is 10 down at 65. Of the iron and steel issues, Vickers eased off to 6s. 7½d.; Babcock and Wilcox are the turn lower at 45s. Vickers drooped to 6s. 6d. Pirelli-General 5½ per cent. debentures are 1½ points up at 104½.

Dollar Stocks

Brazilian Tractions are 2 lower at 19½. In the Mexican group, the Light & Power Company's second preference are lower at 2¾. Mexican Electric Light 5 per cent. first mortgage debentures have rallied to 65½. Brazilian bonds, as distinct from speculative shares, show a harder disposition on the favourable report of Sir Otto Niemeyer. San Paulo Electric 5 per cent. firsts are better, by a couple of points, at 84½. No recovery has occurred from last week's heavy fall in Toronto Suburban Railways 4½ per cent. first mortgage debentures, due to the unexpected intimation that the current coupon would not be paid at present.

Share List of Electrical Companies

HOME ELECTRICITY COMPANIES

	Nom.	Approx. Dividend 1929.	1930.	Price July 28 1931.	Rise or fall.	Yield p.c.
	£					
Bournemouth and Poole	1	15	15	3	—	5 0 0
Brompton Ordinary	1	8½	8½	28/6	—	4 18 3
Central Electricity 4½% Deb. ...	Stock	—	4½	98	-½	4 12 0
Charing Cross Ordinary	1	8½	8½	31/-	+6d.	4 10 4
Chelsea	1	8⅝	8⅝	28/-	—	5 0 0
City of London	1	10	10	37/-	—	5 8 1
Clyde Valley	1	8	8	33/9	—	4 14 10
County of London	1	7	10	46/3	—	4 6 6
Edmundsons' 7% Pref.	1	7	7	26/-	—	5 7 8
Elec. Supply Corporation	1	11	12½	45/-	—	4 17 9
Kensington Ordinary	1	8	8	29/6	—	5 8 6
Lancs. Light and Power	1	7	6½	22/6	—	5 15 7
London & Home Counties 4½% Deb.	Stock	—	—	97¾	-½	4 12 6
London Electric	1	8½	9	34/-	—	5 5 11
Metropolitan	1	9	10	2₃₂	—	4 18 9
Midland Counties	1	6½	7	27/6	—	5 1 10
Mid. Elec. Power	1	15	8	28/3	—	5 13 3
Newcastle-on-Tyne Ordinary ...	1	6	6	22/6	—	5 6 8
do. 7% Pref.	1	7	7	27/6	—	5 1 10
Notting Hill 6% Pref.	10	6	6	11½	—	5 6 8
North Met. Elec. 6% Pref.... ...	1	6	6	24/-	—	5 0 0
St. James' and Pall Mall	1	8	8	29/6xd	—	4 14 1
Scottish Power	1	8	8	28/9	—	5 11 5
South London	1	8½	8½	27/6	—	5 1 10
Urban Ordinary	1	7	7	28/3	—	4 19 1
Westminster Ordinary	1	9¼	8¼	30/-	—	4 13 4
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	25/9	—	5 16 6
Yorkshire Elec.	1	8	8	31/3xd	+6d.	5 2 5

HOME RAILS

Central London Ord. Assented ...	Stock	4	4	77	—	5 3 6
Metropolitan	,,	4	5½	44½	-1	7 17 0
do. District	,,	5	5	62½xd	—	8 0 0
Underground Electric	£1	8	8	20/-xd	—	8 0 0

TELEGRAPHS AND TELEPHONES

Anglo-Am. Tel. Pref....	Stock	6	6	103xd	—	5 17 8
do. Def-	,,	1½	1½	25	—	6 0 0
Automatic Telephone	1	12½	12½	32/6	—	7 13 10
Cables & Wireless 5½% Pref. ...	Stock	5½	5½	52½	-1	10 6 6
do. A 7½% Ord.	,,	Nil	—	14	-1	... ...
do. B Ord.	,,	Nil	—	8	-1½	... ...
Globe Tel. and T. Ord.	10	10	8½	7	—	*12 2 10
do. do. Pref.	10	6	6	9	—	6 13 4
Great Northern Tel.	10	20	20	26	—	7 13 10
Marconi-Marine	1	15	15	32/6	—	9 4 8
Oriental Telephone Ord.	1	12	12	2½	—	*5 6 6

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	—	12/6	—	... ...
do. do. 2nd Pref. ...	5	6	—	7/6	—	... ...
do. do. 5% Deb. ...	Stock	5	5	22½	—	22 8 0
British Electric Traction Def. Ord.	,,	5	5	925	-25	... ...
do. do. Pref. Ord. ...	,,	8	8	124½	—	6 8 9
Brazil Traction	100	8	—	19½	-2	... ...
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	96½	—	5 3 3
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	12/-	—	... ...
London United Tram Deb. ...	Stock	4	4	63½	—	6 7 0
Mexico Trams, 5% Bonds	—	5	5	42½	—	11 15 4
Mexican Light Common	100	Nil	Nil	38	—	... ...
do. 7% Pref.	100	7	7	71½	—	9 15 10
do. 1st Bonds	—	5	5	75½	—	6 12 5
Victoria Falls Ord.	1	15	15	57/6xd	+6d.	5 4 4
Yorkshire (West Riding)		Nil	Nil	6/3	—	... ...

MANUFACTURING COMPANIES

Assoc. Elec. Ord.	1	6	6	20/-	—	6 0
do. Pref.	1	8	8	28/8	—	5 12 3
Babcock & Wilcox	1	15	14	45/-	-6d.	*6 4 5
British Aluminium Ord.	1	10	10	27/6	-⅛	7 5 6
British Insulated Ord.	1	15	15	2¾	—	6 9 1
Brush Ord.	Stock	10	5	60	—	8 6 0
Callenders	1	15	15	2¾	—	5 9 1
do. 6½% Pref.... ...	1	6½	6½	26/3	—	4 19 1
Crompton Parkinson Ord.	5/-	30	30	⅛	+⅛	8 0 0
do. 8% Pref.	1	8	8	28/3	—	5 13 3
Edison-Swan 1st Pref.	1	7½	7½	23/3	-6d.	6 9 0
do. 5% Deb.	Stock	5	5	99½	—	5 8 1
Electric Construction	1	5	Nil	11/3	—	... ...
Enfield Cable Ord.	1	25	25	4	—	6 5 0
English Electric	1	Nil	Nil	5/-	—	... ...
do. do. Pref.	1	Nil	Nil	5/-	—	... ...
Ferranti Pref.	1	7	7	20/6	—	6 16 7
G.E.C. Pref.	1	6½	6½	25/6	—	5 2 0
do. Ord.	1	14	10	2	—	5 0 0
Henley	1	30	30	5½	-¼	5 14 3
do. 4½% Pref.	5	4½	4½	4¾	—	5 2 10
India-Rubber	1	Nil	Nil	4/6	—	... ...
Johnson & Phillips	1	10	10	38/9	—	5 19 2
Siemens Ord.	1	7½	7½	20/9	-6d.	7 4 7
Telegraph Construction	12	10	7½	11	—	8 2 0

*Dividends paid free of Income Tax.

South African Electrical Imports

A Comparison of the 1929 and 1930 Figures

THE following statement, showing the imports of electrical and similar goods into the Union of South Africa during the year 1930 has been compiled from the recently issued official statistics. The figures for 1929 are added for purposes of comparison and notes of any increases or decreases are made.

The figures give a total of £2,721,000 as the value of South African electrical imports during 1930. The corresponding figure for 1929 was £3,093,000. In addition to the material specified, a considerable quantity of equipment was imported by the Government, the principal item being telegraph and telephone material. In 1930 Great Britain remained the chief supplier with a share of £1,651,000, or 67 per cent., against £1,958,000 (63 per cent.) in 1929. The value of imports from the United States declined from £462,000 to £411,000, thus remaining at about 15 per cent., while Germany's share fell from £306,000 to £267,000, the proportion (about 10 per cent.) remaining the same. It will be seen that unenumerated machinery constituted the largest class of electrical imports; Great Britain secured about 70 per cent. of this trade in 1930, against 73 per cent. in the preceding year. The lion's share of the imports of electric wires and cables was supplied by this country in both years, although there was a substantial decline in 1930.

In some of the import items the United States retained its ascendancy over Great Britain, notably in primary and secondary batteries. Canada obtained the largest share of the heating and cooking apparatus trade. The Dominion has become a serious competitor of the Home country in the supply of this apparatus to other Empire countries. The South African market for this equipment has shown rapid expansion in the past few years but Great Britain's share, although it has grown, has not progressed in the same ratio. Between 1929 and 1930, for instance, the total rose by about 34 per cent., and while the shares of Canada, the United States, and Germany increased by 33, 46, and 20 per cent., respectively, Great Britain's made an advance of just over 2 per cent. In the imports of hand lamps Great Britain is surpassed by both the United States and Germany.

	1929. £	1930. £	Inc. or dec. £
Electrical cable and wire—			
Total	771,000	578,000	−193,000
From Great Britain	680,000	503,000	−177,000
,, United States	7,000	5,000	− 2,000
,, Germany	60,000	50,000	− 10,000
,, Belgium	9,000	9,000	—
,, Holland	11,000	7,000	− 4,000
Heating and cooking apparatus—			
Total	133,000	178,000	+ 45,000
From Great Britain	44,000	45,000	+ 1,000
,, United States	24,000	35,000	+ 11,000
,, Germany	15,000	18,000	+ 3,000
,, Canada	46,000	61,000	+ 15,000
Meters, electric—			
Total	34,000	32,000	− 2,000
From Great Britain	20,000	25,000	+ 5,000
,, Germany	8,600	5,400	− 3,200
,, United States	600	100	− 500
,, Switzerland	2,100	500	− 1,600
Insulators (not porcelain)—			
Total	8,000	1,600	− 6,400
From Great Britain	5,100	600	− 4,500
,, United States	800	70	− 730
,, Germany	400	900	+ 500
Insulators (porcelain)—			
Total	10,800	10,900	+ 100
From Great Britain	5,400	5,800	+ 400
,, Germany	1,800	1,400	− 400
,, United States	2,000	2,600	+ 600
Electrical material, other—			
Total	55,000	39,000	− 16,000
From Great Britain	18,000	20,000	+ 2,000
,, United States	11,000	6,600	− 4,400
,, Germany	7,300	4,000	− 3,300
,, Italy	2,800	2,600	− 200
,, France	700	500	− 200
,, Sweden	13,000	1,200	− 11,800
Electric hand lamps—			
Total	28,000	22,000	− 6,000
From Great Britain	2,200	1,600	− 600
,, Germany	6,100	4,800	− 1,300
,, United States	19,000	15,000	− 4,000
Other electric lamps, globes, &c.—			
Total	168,000	146,000	− 22,000
From Great Britain	72,000	52,000	− 20,000
,, Austria	14,000	13,000	− 1,000
,, Germany	19,000	16,000	− 3,000
,, Holland	32,000	27,000	− 5,000
,, United States	11,000	13,000	+ 2,000
,, Hungary	6,700	15,000	+ 8,300
Electric lighting outfits, self-contained—			
Total	39,000	12,500	− 26,500
From Great Britain	15,000	8,100	− 6,900
,, United States	21,000	4,400	− 16,600
Radio apparatus and parts—			
Total	175,000	257,000	+ 82,000
From Great Britain	56,000	80,000	+ 24,000
,, United States	26,000	53,000	+ 27,000
,, Germany	22,000	36,000	+ 14,000
,, Holland	71,000	83,000	+ 12,000
Telegraph and telephone material—			
Total	58,000	40,000	− 18,000
From Great Britain	31,000	20,000	− 11,000
,, Sweden	5,300	4,300	− 1,000
,, United States	3,800	4,700	+ 900
,, Germany	14,000	7,800	− 6,200
,, Belgium	1,000	3,500	+ 2,500
Batteries, primary—			
Total	199,000	158,000	− 41,000
From Great Britain	35,000	37,000	+ 2,000
,, United States	125,000	99,000	− 36,000
,, Germany	14,000	6,100	− 7,900
,, Denmark	5,200	7,500	+ 2,300
,, France	5,900	7,500	+ 1,600
Batteries, secondary—			
Total	75,000	35,000	− 40,000
From Great Britain	23,000	13,000	− 10,000
,, United States	38,000	17,000	− 21,000
,, Germany	8,600	500	− 8,100
,, France	3,000	3,800	+ 800
Motors—			
Total	182,000	142,000	− 40,000
From Great Britain	105,000	83,000	− 22,000
,, United States	28,000	20,000	− 8,000
,, Germany	20,000	14,000	− 6,000
,, Holland	3,900	10,000	+ 6,100
,, Sweden	10,000	3,500	− 6,500
,, Denmark	5,200	1,800	− 3,500
Transformers—			
Total	123,000	126,000	+ 3,000
From Great Britain	82,000	83,000	+ 1,000
,, United States	16,000	7,000	− 9,000
,, Germany	13,000	14,000	+ 1,000
,, Holland	3,600	8,200	+ 4,600
Dynamos and generators—			
Total	53,000	77,000	+ 24,000
From Great Britain	45,000	69,000	+ 24,000
,, Germany	2,900	1,300	− 1,600
,, United States	3,500	1,500	+ 2,000
Electrical machinery, other—			
Total	981,000	866,000	−115,000
From Great Britain	719,000	605,000	−114,000
,, United States	115,000	127,000	+ 12,000
,, Germany	103,000	87,000	− 16,000
,, Sweden	12,000	9,000	− 3,000
,, Canada	500	600	+ 100
,, Holland	8,000	11,000	+ 3,000
,, Switzerland	7,700	5,000	− 2,700

Japanese Competition Threatened

Although Japan does not appear in the import figures, there are signs that Japanese goods are beginning to enter the market. A prominent Durban electrical engineer and contractor, Mr. H. P. Borlase, recently stated that small articles such as shades, flexibles, switches, globes, &c., were being landed in the country at about a third of the normal prices. These articles are being retailed through the ubiquitous "bazaars," and it is being found that larger Japanese appliances are now making their appearance. The trade in kettles, water heaters, irons, and even fires, is being felt by local manufacturers, who already find it difficult to compete with British, American and Continental makers.

Prospective South African Business

An indication of future orders for electrical plant is contained in a recent article by the Port Elizabeth correspondent of the *Chamber of Commerce Journal*. He states that a further portion of the Natal main line is to be electrified. It is proposed to carry the electricity to Cato Ridge, many miles further than at present. This will necessitate the building of a new sub-station between Maritzburg and Cato Ridge, which will house two 2,000-kW motor-generators. Business in agricultural machinery and implements has improved; mining materials, machinery, &c., remain in steady demand, and the outlook, with two large new gold mines to be equipped, is promising. The town of Brakpan is to spend £10,000 on its electrical installation, and Johannesburg expects authority to raise £500,000 for extensive additions to its electric power station plant, &c., at an early date. Several small towns are contemplating installing electrical plants, and extensive additions to the Pretoria electricity distribution system are in progress or under consideration.

Parliamentary Notes

[By Our Special Parliamentary Reporter.]

The Malton-Whitby Scheme

On July 21st, MR. TURTON asked the Minister of Transport if he could give an estimate of the cost of the transmission system between Malton and Whitby; if it followed the railway line between Malton and Whitby; and if it crossed the hill-tops.

MR. PARKINSON, who replied, said he understood that the estimated total cost of the line between Malton and Whitby as designed to be carried out by the Central Electricity Board was £63,000, that if the railway line were followed the extra cost of constructional works would be at least £16,000; and that if by crossing the hill-tops was meant a route on the west side of the river, the extra constructional cost would be at least £10,000. He also understood that both alternative routes passed through country inaccessible to contractors' lorries, unless proper roads and several bridges were constructed. That would, of course, involve additional expense.

L. & N.E.R. Electrification

On July 22nd, SIR PHILIP DAWSON asked the Minister of Transport if he could state when it was anticipated that the Development (Public Utility) Advisory Committee would make its report to the Government on the request of the London and North Eastern Railway Company for financial assistance in electrifying some of its suburban lines out of King's Cross station.

MR. MORRISON said he understood that this matter had been discussed between the Advisory Committee and the railway company, and it had been agreed that the company's application in respect of the electrification of its Great Northern suburban area should remain in abeyance pending the decision of Parliament upon the London Passenger Transport Bill. In the event of the Bill being passed, the company would submit a proposal to the joint committee representing the board and the main-line companies, to be set up under the Bill, for approval, along with the traffic and revenue considerations appropriate to the proposal, and if the scheme met with the joint committee's approval, would renew its application to the Advisory Committee, placing before it any new and relevant data.

Reduced Telephone Charges

On July 22nd, MR. ATTLEE, Postmaster-General, informed Mr. Marcus that the following reductions in telephone charges were to be made with effect as from October 1st next:—

Residence lines.—Internal extensions without intercommunication: From 6s. to 4s. a quarter. Internal extensions with intercommunication: From 9s. to 8s. a quarter. *Business lines.*—Non-intercommunicating extensions: From 6s. to 5s. a quarter. *Large installations.*—Instead of the present flat rate of 9s. a quarter, the following scale will apply: First 50 extensions, 9s. a quarter per extension; next 150 extensions, 8s. a quarter; next 200 extensions, 7s. a quarter; additional extensions (beyond 400), 6s. a quarter per extension. Substantial reductions would also be made in the charges for long-distance private telephone circuits. He proposed also to modify the conditions of telephone agreements so as to allow notice of termination to become effective three months after the date on which it was given.

Main-line Electrification

On July 23rd, during the debate on the Vote for the Ministry of Transport, SIR G. RENTOUL pressed the Minister to give some indication of the attitude of the Government towards the electrification of the main-line railways. At present, he said, the railways consumed between 15,000,000 and 16,000,000 tons of large coal a year, and he understood that electrification might well mean a reduction in that consumption of over 70 per cent., and that there was no alternative market readily available. The net result might well be the permanent throwing out of work of 60,000 miners. Did the Minister believe that this scheme would cheapen railway transport, and did he consider that it would bring back traffic to the railways from the roads? If the figure of £300,000,000 in the Weir Report were correct, would that involve a Government subsidy?

LT.-COL. ASHLEY, the former Minister of Transport, contended that electrification of the main lines would not only help industry by making a better load factor, but would also make it easier for rural electrification to take place. He hoped, therefore, that the Minister would not turn down the suggestion in the Weir Report simply because it would cost £400,000,000 spread over 20 years.

The Minister's Reply

MR. MORRISON, in his reply, said that, as to electrical development, it was satisfactory to note that the consumption of electricity was increasing year by year despite the trade slump. Consumption in both Germany and America had decreased. Where charges for electricity were deemed to be too high it was open to local authorities to make application to the Minister to make an Order for a local inquiry, and, if necessary, to fix a maximum price. Any body of 20 consumers had a statutory right to make such an application, and he was surprised that, where electricity prices were notoriously high, there had not been greater exercise of those rights.

Dealing with the Weir Report, the Minister said that it raised important issues of industrial policy, and it had got to be taken into the greatest consideration by the Government in dealing with the future of the railways. It was perfectly true that the Weir Committee indicated that coal consumption would be reduced by 3.8 per cent., or nearly 10,000,000 tons a year. It was perfectly true that part of the economy which would be secured would be the result of the re-organisation on the locomotive side of the industry. But they must not be afraid of carrying through a great scheme of industrial equipment because of those two facts. The report must not frighten them because it dealt with big figures.

The present position was that the report had been sent to the railway companies for observation and that their technical staffs had been examining it. He believed that they were still, in some subsidiary respects, examining it. It was significant that the general manager of the L. & N.E.R. signed the report. The railway companies had communicated to the Government, not their detailed views upon the report, but a letter which indicated certain broad considerations. The question had been raised as to the publication of that letter. He was not afraid of its publication, but he thought it right that the question of publication should not be determined until he had had an opportunity of communicating with the railway companies and had given them an opportunity of elaborating their point of view. He had now arranged to meet them on July 31st, when the whole problem would be discussed.

Legal

Alleged Infringement of Trade Marks

MR. JUSTICE EVE, in the Chancery Division on July 23rd, had before him an action by Messrs. A. P. Lundberg & Sons, Ltd., against Letrik, Ltd., Milton Street, E.C., for an injunction restraining the alleged infringement of three trade marks, and from passing off as and for the plaintiffs' goods electric combs by the use of the word "Letrik"; and also for an injunction restraining the defendants from trading in connection with electrical goods under the name Letrik, Ltd., or any other name that would lead to confusion.

MR. P. STUART BEVAN, for the plaintiffs, said they were an old-established concern who made many kinds of small electrical accessories, and sold them under the trade mark "Lektrik." Their trade was not confined to that class of goods; they had made parts for use with hairdressing appliances such as switches for hair driers. They claimed that the use by the defendants of the word "Letrik" was an infringement of their own mark and caused confusion in the minds of the trade and the public.

The defendants were moving for the rectification of the trade mark register by excluding from the classes for which the plaintiffs were registered, hair combs and goods of a like description on the ground that there had been no *bonâ fide* user, which the plaintiffs denied.

Evidence was called for the plaintiffs, and MR. R. MORITZ, K.C., submitted his contentions for the defence that there was no infringement and no passing-off. With regard to the latter, he said that he had not heard that the plaintiffs sold electric combs or any other goods of an analogous character.

MR. ATKINSON, managing director of the defendant company, said they sold other hairdressing goods besides combs, including hair restorer. Since they began business about May last year, they had sold between 800,000 and a million combs. There could be no confusion, he thought, between the plaintiffs' and the defendants' goods.

Giving his reserved judgment on Tuesday last, Mr. Justice Eve held that there had been no intent to defraud and that so far as was known no confusion had arisen from the similarity of the words in question. He therefore dismissed the action, with costs. His Lordship said that he would hear the defendants' motion for a declaration that the plaintiffs' trade-mark did not extend to electric combs and similar goods on the following day.

Johnson & Phillips Sued for Compensation

AT the Banbury County Court last week, Mr. B. H. White, on behalf of his three infant nieces, brought an action against Messrs. Johnson & Phillips, Ltd., claiming compensation for the loss of their father, Mr. J. Dugdale. It was stated that Mr. Dugdale was employed by the defendant company at Eydon as an electrical linesman. While engaged on a line he came into contact with a live wire and sustained severe injuries, death ensuing shortly afterwards. It was admitted that the work which he was doing was in contravention of the foreman's orders, but it was submitted that the act was done in furtherance of his duties as a linesman. The circumstances were similar to those in a case in which the House of Lords had given judgment for a plaintiff.

Supporting evidence having been given, a solicitor for the respondent company submitted that by acting against instructions the deceased took a risk quite outside his ordinary employment.

His Honour Judge Drucquer adopted this view of the case, and, while expressing his regret, entered judgment, with costs, for Messrs. Johnson & Phillips, Ltd. He granted a stay of 21 days with a view to an appeal being made.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

An Important Steelworks Contract

We notice a paragraph in your issue dated July 24th, under the above heading, which states that the English Electric Co. has been instructed to "proceed with the whole of the electrical equipment for the South African Iron and Steel Corporation." This statement is not correct, and we would ask you kindly to give prominence in your next issue to the fact that we have been entrusted with the order for the whole of the auxiliary motor equipments, including the motors themselves, the starting and control apparatus and also the cables and low-pressure distribution plant.

This order we have received from Messrs. Dorman, Long, acting as main contractors. It approaches £100,000 in value, and includes the supply and complete erection on site, laying and connecting of the cables, and the setting to work of the whole equipment embraced in their order. There are in all some 600 motor equipments totalling over 10,000 b.h.p. and varying in size from 200 b.h.p. downwards. Among these are some 200 special steelworks type of motor, of the "Asea" heavy type designed with split steel casings and constructed to withstand the very heavy duty of up to one thousand operations per hour. The majority of the motors are equipped with fully-automatic or semi-automatic control gear of the contactor type.

We trust you will be kind enough to insert in your next issue this qualification, and thank you in advance for your courtesy.

ASEA, LTD.
G. L. Kirkpatrick, *Director.*

London, W.C.2, *July 24th.*

[We understand that the English Electric Company's contract covers the whole of the electrical equipment for the *main* electrification of the plant; this was not made clear in the original note.—EDS. ELEC. REV.]

Matters are Moving!

The cheerful note struck in your leading article of last week under the above title was echoed in the House of Commons debate on the Ministry of Transport estimates. It is evident that the Ministry and the railway companies are prepared to go into the question of main-line electrification in a more practical and businesslike spirit than seemed possible when the Weir Report was issued. The obvious duty of the electrical industry is to make the most of this favourable atmosphere. There appears, however, to be a tendency to indulge in a controversy between straight electrification and oil-electric traction. Although the weight of responsible opinion, even in oil-electric circles, is in favour of treating oil-electric traction as supplementary to electrification, certain advocates of the oil-electric system are presenting their case in such a way as to suggest that they hold a complete substitute for electrification. This policy is calculated to confuse the public mind and to give a handle to those who are anxious to delay or oppose the progress of the Weir scheme.

It would surely be much better for all concerned if the industry showed a united front on the broad question of electrification and left the determination of the respective fields of the two electrical methods to subsequent discussion based upon the operating characteristics of each particular route.

July 24th, 1931. PROTONIUS.

[A reply given to a question in the House of Commons on Tuesday last relative to this matter is of interest. Lt.-Commander Kenworthy asked what advantages Diesel-electric traction possessed as an adjunct to main-line electrification. Mr. Parkinson reminded him that the potentialities of the system, particularly in the case of lightly-loaded branch lines, were dealt with in the Weir Report, the Committee having referred to the working of the system in Argentina, Switzerland, and elsewhere. Experience of Diesel-electric traction was at present limited to special requirements, but he understood that the British railway companies were investigating it. The Minister of Transport proposed to ask them to report upon the results of any experiments which they undertook.—EDS. ELEC. REV.]

Induction Motors

By the letter published in your July 24th issue Mr. H. G. Paxon, of Power Contracts (Batwin), Ltd., ridicules Mr. D. G. Sandeman's generalisation that the starting torque of repulsion motors (or repulsion-start induction motors) is of the order of 2½ times full-load torque. A study of the characteristics of these motors by the leading makers (including American machines supplied by Mr. Paxon's principals) provides abundant evidence that Mr. Paxon's figure of 5 times f.l. torque is open to the greater criticism.

The criterion of excellence is not a starting torque so many times f.l. torque as to be unnecessary, or even objectionable, for most applications. Rather is it the highest possible efficiency and power factor consistent with reasonable starting torque and overload capacity, it being remembered that by a reduction of stator turns the starting torque can always be increased at the expense of current consumption at full load.

Static torque is also influenced by poleage, so that 2½ times f.l. torque is exceptionally high for 6-pole motors, while 2¼ to 3¼ is typical for 4-pole machines. Generally, only with a few 2-pole motors can a value of 5 be pardoned. I recently observed in a batch of standard ¼-b.h.p. 4-pole repulsion motors of various makes that one (of British manufacture) had a current consumption 10 per cent. lower than that of its nearest competitor. Its minimum static torque was 2¼ times that at f.l. To allege that no self-respecting manufacturer would pass such a motor is sheer bunkum.

It should also be noted that repulsion induction motors exhibit *maximum* and *minimum* static torques, which may be repeated in one revolution as many times as there are number of commutator segments. By careful selection of the slotting, number of commutator segments, width of brush, &c., static-torque fluctuation can be minimised, but it is very seldom that a motor has a minimum torque above 75 per cent. of the maximum. Obviously static torque should always refer to the absolute minimum.

PERCY HUGGINS, A.M.I.E.E., Assoc.A.I.E.E.

Maidstone, *July 25th*, 1931.

Fuel Returns

With reference to the article on page 138 of your current issue dealing with the latest returns of the Electricity Commissioners of fuel consumption, &c., in the paragraph headed "Lowest Fuel Consumption" it is stated that "two stations share the honour of being third on the list, Ferrybridge, of the Yorkshire Electric Power Co., and Barton, of the Manchester Corporation, for both of which is shown an average fuel consumption of 1.31d. lb. per kWh."

Might I point out that this statement is incorrect, as the Deptford (West) station of this company takes third place with a fuel consumption of 1.29 lb. per kWh generated.

S. L. PEARCE, *Engineer-in-chief*,
London Power Co., Ltd.

Westminster, *July 25th*, 1931.

Experience

I should like to draw your attention to a fact, which, to me, is somewhat puzzling. I refer to advertisements under "Situations Vacant," practically all of which call for experience of the particular position advertised. Now, if everybody wants men with experience, so far as I can see, these will gradually die out, and we shall be left with a host of college engineers with only a general theoretical training.

I am prompted to write the above, as although I have had some experience of overhead-line construction and cable laying, this has proved to be insufficient, and of the numerous firms I have written to not one has been able to offer me an opportunity of gaining that extra experience which I require. Even the grid, apparently, has not made any difference, nor, may I add, have my technical qualifications.

Perhaps some of your readers can enlighten me on the subject.

Wimbledon, *July 27th*, 1930. PUZZLED.

Earthing the Neutral

I have hesitated long to write this letter, lest by so doing I display frightful ignorance. But, as no one else seems ready to raise the point, I must do so or else leave my curiosity unsated.

In your issue of July 10th, in an article on "Rural Distribution Problems," the author states on page 51, fig. 1, that the earth resistance R must not exceed $50/60 \times 2.5 = 0.33$ ohm in order that the neutral conductor may never attain a potential to earth exceeding 50 V. It seems to me that the correct value should be 50/60 and I fail to see whence the factor 2.5 is dragged in. Enlightenment would be much appreciated by

July 27th, 1931. PERPLEXITY.

Norwegian Power Exportation Scheme

A scheme to export electricity from Norway to Germany and Denmark is to be closely studied by a joint international company formed by Norwegian, Swedish, Danish and German interests, according to a report made by the United States Commercial Attaché at Oslo. The name of the company will be the "Limited Company for the Study of Norwegian Current Export" and it will have a capital equivalent to about £9,000. As indicated by its name, the company will work chiefly for research purposes. The technical, economic, financial and legal sides of the question are to be considered and, if possible, practical solutions of all of them submitted. The project has created considerable interest in Norway, as the country would benefit considerably if some of its undeveloped water power could be made into a source of supply for other countries.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1929.

39,667. "Electro-magnetically-operated apparatus for imparting vibratory motion to a screen or the like." M. P. Reynolds. December 28th, 1929. (351,946.)

1930.

478. "Fire-alarm systems." Telefonaktiebolaget L. M. Ericsson. January 7th, 1929. (352,037.)

2,948. "Sub-aqueous sound receivers and transmitters." Soc. de Condensation et d'Applications Mécaniques and M. Touly. February 25th, 1929. (352,040.)

3,048. "Electric order-telegraphs for use on ships." H. H. Chapman and W. H. Gates. January 29th, 1930. (351,949.)

3,879. "Electric cables." A. W. Clegg. February 5th, 1930. (352,041.)

6,988. "Picture and the like telegraph systems." Marconi's Wireless Telegraph Co., Ltd. March 1st, 1929. (352,007.)

7,115. "Permanent magnets." A. Kupeczek and Measurement, Ltd. March 4th, 1930. (352,043.)

7,485. "Electro-magnetically-operated valves." J. L. Musgrave and R. Crittall & Co., Ltd. December 3rd, 1930. (352,091.)

8,793. "Means for tuning or otherwise controlling electrical amplifying circuits." L. H. Pearson and W. J. Randall. March 19th, 1930. (351,934.)

9,036. "Switch and other wall-boxes for use in connection with electrical wiring conduits." Simplex Conduits, Ltd., and H. F. McLoughlin. March 21st, 1930. (351,980.)

9,290. "Hangers or suspension devices for electric fittings and lamps." G. H. Scholes & Co., Ltd., G. H. Scholes, and F. J. Pearce. March 24th, 1930. (352,008.)

9,501. "Electrical insulators." K. A. Hawley. March 25th, 1929. (352,010.)

9,517. "Electric totalisator systems." Siemens Bros. & Co., Ltd., and J. H. Broome. March 25th, 1930. (351,954.)

9,638. "Electric carrier-wave transmission systems." Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). March 26th, 1930. (352,011.)

9,648. "Safety fuses for electric circuits." J. R. Spink and J. B. Langley. March 26th, 1930. (351,955.)

9,686. "Dynamo-electric machines." K. Hinterseer and L. Laub. March 29th, 1929. (351,957.)

9,778. "Photo-electric cells." Electrical Research Products, Inc. April 6th, 1929. (352,012.)

9,779. "Apparatus for reproducing pictures and sounds." British Thomson-Houston Co., Ltd. March 27th, 1929. (352,050.)

9,781. "Cable shoe for electric conductors, especially for motor vehicles." F. Faudi. March 27th, 1930. (352,013.)

9,904. "Method for electrically recording changes in physical conditions." H. E. Linckh and R. A. J. Kluge. March 28th, 1929. (352,051.)

9,927. "Apparatus for generating or receiving high-frequency electrical waves." Standard Telephones and Cables, Ltd. (A. G. Clavier). March 28th, 1930. (352,052.)

9,994. "Carrier-wave signalling systems." G. Priechenfried. March 28th, 1930. (351,991.)

10,002. "Impedance relays." International General Electric Co., Inc. March 28th, 1929. (Addition to 307,806.) (352,015.)

10,010. "Electric accumulators." Britannia Batteries, Ltd. March 28th, 1929. (352,055.)

10,070. "Photo-electric cells." Electrical Research Products, Inc. April 18th, 1929. (352,057.)

10,094. "High-frequency receiving systems." British Thomson-Houston Co., Ltd. March 29th, 1929. (352,017.)

10,183. "Automatic and semi-automatic telephone systems." Siemens Bros. & Co., Ltd., and J. E. Tees. March 31st, 1930. (351,959.)

10,184. "Telegraphic apparatus." Naamlooze Vennootschap Internationale Verreschrijver Maatschappij. March 30th, 1929. (351,960.)

10,199. "Piezo-electric crystals." Electrical Research Products, Inc. April 2nd, 1929. (351,940.)

10,200. "Magnetic materials." Electrical Research Products, Inc. April 2nd, 1929. (352,019.)

10,235. "Electric turbo-generator plants." Akt.-Ges. Brown, Boveri et Cie. April 8th, 1929. (Addition to 334,473.) (352,020.)

10,252. "Magnet cores for use in loading coils and the like." Automatic Telephone Manufacturing Co., Ltd., and P. N. Roseby. March 31st, 1930. (Addition to 4,316/29.) (351,943.)

10,306. "Means for controlling electrical amplifying circuits employing thermionic valves and the like." L. H. Pearson. April 1st, 1930. (352,021.)

10,391. "Television and like systems." Marconi's Wireless Telegraph Co., Ltd. April 1st, 1929. (351,972.)

10,423. "Electric conductors." Okonite-Callender Cable Co., Inc. April 10th, 1929. (352,060.)

10,526. "Electric lamps for vehicle headlamps and the like." W. H. Lund, and W. C. Howard. April 3rd, 1930. (352,063.)

10,569. "Electrical transmission of pictures, moving objects, or the like." Standard Telephones & Cables, Ltd., and S. H. Boss. April 3rd, 1930. (352,029.)

10,570. "Amplifiers using space-discharge devices." Standard Telephone & Cables, Ltd. (Western Electric Co., Inc.). April 3rd, 1930. (352,030.)

10,614. "Electromagnetic vibratory devices for use in signalling systems." Associated Telephone and Telegraph Co. April 8th, 1929. (352,032.)

10,680. "Control of electric generators for arc welding." J. H. Holmes & Co., Ltd., and A. T. Robertson. April 4th, 1930. (352,066.)

10,923. "Welding electrodes, and coatings therefor." P. S. D. Smith (Hollup Corporation). April 5th, 1930. (352,086.)

11,300. "Electric immersion heaters." G. E. Green. April 9th, 1930. (352,094.)

11,301. "Electric signal band reduction." Standard Telephones & Cables, Ltd., E. K. Sandeman, and A. H. Roche. April 9th, 1930. (352,095.)

11,302. "Automatic or semi-automatic telephone exchange systems." Standard Telephones & Cables, Ltd., W. Hatton, and E. J. Rousseau. April 9th, 1930. (352,096.)

11,303. "Electric communication transmission system employing filters." Standard Telephones & Cables, Ltd., and E. K. Sandeman. April 9th, 1930. (352,097.)

11,307. "Signal transmission over submarine cables or the like." Standard Telephones & Cables, Ltd., and S. H. Grove. April 9th, 1930. (352,098.)

11,324. "Electric contacts." C. R. Cook. April 9th, 1930. (352,102.)

11,354. "Lamps for use in television and like systems." Gramophone Co., Ltd., and R. B. Morgan. April 9th, 1930. (352,105.)

11,933. "Resistance controllers for electric circuits." E. W. Seeger. June 7th, 1929. (352,116.)

12,931. "Portable electric lamps." Oldham & Son, Ltd., and G. H. Darby. April 26th, 1930. (352,134.)

12,999. "Elimination of electrical interference." Igranic Electric Co., Ltd., and L. H. Paddle. April 28th, 1930. (352,135.)

13,776. "Automatic electric cut-out device." F. L. Chinnery. May 5th, 1930. (352,144.)

14,168. "Thermionic valve circuit arrangements." General Electric Co., Ltd., and W. H. Peters. May 8th, 1930. (352,150.)

14,576. "Automatic switching arrangements for balancing equipment." British Thomson-Houston Co., Ltd. May 10th, 1929. (352,158.)

16,337. "High-tension cables." Siemens-Schuckertwerke Akt.-Ges. June 1st, 1929. (352,186.)

19,228 "Method of electric welding." R. D. Malm. June 24th, 1930. (352,223.)

19,841. "Supporting arms for electrical pick-up devices." S. McClatchie. June 28th, 1929. (352,242.)

22,122. "Lightning arrestors." Associated Electrical Industries, Ltd. July 22nd, 1929. (352,273.)

22,275. "Thermionic high-frequency electric generators." C. Lorenz Akt.-Ges. July 27th, 1929. (352,276.)

23,447. "Pupinized submarine cables." Siemens-Schuckertwerke Ges. (in liquidation). August 6th, 1929. (Addition to 259,571.) (352,285.)

24,578. "Electric lamp sockets." W. Fairweather (Singer Manufacturing Co.). August 16th, 1930. (352,301.)

24,706. "High-tension air-break electric switches." Associated Electrical Industries, Ltd. August 20th, 1929. (352,302.)

28,917. "Flexible electric conductors." British Thomson-Houston Co., Ltd. September 26th, 1929. (352,327.)

29,538. "High-tension hollow electric cable." W. W. Triggs (Vereinigte Aluminium-Werke Akt.-Ges.). October 2nd, 1930. (352,337.)

29,909. "Automatic electric switch, adapted in particular to the control of the ignition of internal-combustion engines." M. Charles. October 31st, 1929. (352,341.)

31,995. "Luminous electric discharge tubes." General Electric Co., Ltd. November 29th, 1929. (352,352.)

31,996. "Luminous electric discharge tubes." General Electric Co., Ltd. November 30th, 1929. (Addition to 352,352.) (352,353.)

33,181. "High-frequency signalling systems." British Thomson-Houston Co., Ltd. November 4th, 1929. (352,357.)

34,335. "Windings of dynamo-electric machines." Siemens-Schuckertwerke Akt.-Ges. February 15th, 1930. (352,365.)

36,425. "Amplifier station for deep-sea signalling cables." Felten & Guilleaume Carlswerke Akt.-Ges. December 18th, 1929. (352,369.)

39,101. "Measurement of electrical energy." Ferranti, Ltd., and W. Holmes. February 26th, 1930. (Divided application on 6,411/30.) (351,973.)

Paris Refuse-destructor Installations

Some interesting facts concerning the Paris suburban refuse-destructor installations at St. Ouen, Issy-les-Moulineaux, Romainville and Ivry, are given by Jules Colon in an article in *Power*. From the total heat recovered 70,000,000 kWh per year is generated, while among other by-products the resulting clinker supplies concrete aggregates and a raw material for brick manufacture. The composition of the refuse varies with the locality and the season, and the variation is such that a successful treatment in one place may prove a failure elsewhere. After several years of research, the following figures were determined for use as a designing basis:—

Heat value, B.t.u. per lb. as fired:	
Maximum in March	4,000
Minimum in September	2,700
Yearly average	3,400
Moisture content, per cent.:	
In summer, when the amount of vegetable refuse is high	55
In winter	25
Yearly average	40
Ash content, per cent.:	
Summer	34
Winter	43
Yearly average	39

The complete process includes the following operations: magnetic separation of metallic scrap; screening (the fine material exacted from this operation is sold as fertilizer); pre-incineration drying; generation of electricity; fabrication of constructon materials. Every lot of refuse collected is not submitted to the complete sequence of operations; seasonal variations in the composition permit of simplifying the treatment. In winter, for instance, it is profitable to extract the finer part of the refuse to sell as fertilizer.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Abbots Langley.—Conversion of poor law buildings into mental hospital (£72,000); L.C.C. architect.

Ayr.—Houses (200) for the T.C.; burgh surveyor. Cinema (2,000 seats); J. McAllister, solicitor, Glasgow.

Barnsley.—Houses (72), Ardsley, for the T.C.; borough engineer. Nurses' quarters, Kendray Hospital (£10,494), for the T.C.; W. Johnson & Sons, Ltd., builders, Wombwell.

Beverley (YORKS.).—Houses (44), Cherry Tree Lane, for the T.C.; Whiteing & Reynolds, architects, Ladygate.

Birmingham.—Branch bank, Alcester Road South; Corporation Bank Committee. Chapel, Shenley Lane, Weoley Castle estate; Free Church Council. Church, Trittiford Road, Billesley; Catholic trustees. Welfare centres, Billesley and Kingstanding estates (£11,640) and extensions, Coleshill Hall mental colony (£45,000); city engineer. Improvements, various schools (£41,800), and extensions, Birches Green and Gunter Road schools (£8,600), for the E.C.

Blackpool.—Alterations and additions to premises, 13, Whitegate Drive, for the District Bank, Ltd.; Jones & Dalrymple, architects, 180, Oxford Road, Chorlton-on-Medlock, Manchester.

Blaydon-on-Tyne.—Houses (106) for the U.D.C.; Mr. Masthils, surveyor.

Blyth.—School, Bebside, for the E.C.; L. Leeper, surveyor, Ridley Avenue.

Bradford.—Shops, Heights Lane; T. & R. Illingworth.

Brighton.—School, Whitehawk housing estate (£35,769), for the borough E.C.; director of education.

Burton-on-Trent.—Wesleyan Church, Measham Road, Ashby Woulds; A. Brocklehurst, architect, 10, Norfolk Street, Manchester.

Cambridge.—Re-erection of the Rendezvous cinema and dance hall (electrically equipped), Magrath Avenue; C. Naylor, proprietor.

Cheltenham.—Cinema theatre, Winchcombe Street, for Albany Ward Theatres, Ltd., 47, Cranbourn Street, London, W.C. Houses (58), St. Mark's estate, for the T.C.; borough surveyor.

Chester.—School, Lache housing estate, for the city E.C.; director of education.

Colchester (ESSEX).—Three schools for the city E.C.; director of education.

Colinsburgh (FIFE).—Re-erection of engineering works, Main Street, for A. & R. Brown.

Cricklade and Wootton Bassett (WILTS.).—Houses (36) for the R.D.C.; R. C. Hawkes, clerk, Wootton Bassett.

Croydon.—Rebuilding West Croydon Station for the Southern Railway Co.

Derbyshire.—Bakery, Mickleover Mental Hospital, for the C.C.; county architect, St. Marysgate, Derby. Smallpox hospital, Penmore, for the C.C.; clerk, Derby.

Dewsbury.—Extensions, technical college (£15,300), for the borough E.C.; borough surveyor.

Doncaster.—Extensions to factory premises of Radiance, Ltd.; Nilburn & Atkinson, architects, Exchange Buildings, Market Place.

Dorchester.—Houses, Victoria Park estate; borough engineer.

Dudley.—Senior school, Brewery Fields, for the borough E.C.; Crouch, Butler & Savage, architects, 67a, New Street, Birmingham.

Edinburgh.—Extensions, James Gillespie's High School for Girls (£13,000), for the city E.C.; clerk.

Epping.—Houses (26) for the U.D.C.; H. G. Acres, builder. Houses (50), No. 2 housing scheme for the U.D.C.; E. Stockdale, surveyor.

Esher (SURREY).—Houses (42) for the U.D.C.; surveyor.

Farnborough (HANTS.).—Houses (100) for the U.D.C.; surveyor.

Farnham (SURREY).—Houses (26) for the R.D.C.; A. J. Stedman, architect, South Street.

Fifeshire.—Church for Markinch U.F. Church; the minister.

Folkestone.—School (300 places), Leonard Road, for the borough E.C.; director of education.

Fordingbridge (HANTS.).—Houses (32) for the R.D.C.; C. Damen & Son, architects, Ferndown, Dorset.

Gillingham (KENT).—Rebuilding station; Southern Railway Co., Ltd.

Gosport (HANTS.).—Houses (142), Privett estate, for the T.C.; borough surveyor.

Great Yarmouth.—Houses (34) and flats, for the T.C.; H. A. Holmes, builder.

Grimsby.—Houses (100), Nunsthorpe estate (£36,400); borough engineer.

Hailsham (SUSSEX).—Houses (26) for the R.D.C.; surveyor.

Hamilton.—R.C. school, Cadzow (£19,000); R. Ross, architect.

Hampshire.—New senior school, Butlocks Heath, Hound, and extensions to elementary school, Hayling (£10,000), and County School for Girls, Winchester (£12,750), for the county E.C.

Herefordshire.—Extensions, Hereford High School; director of education, County Education Offices, Hereford.

Herne Bay.—Houses (27) for the U.D.C.; surveyor.

Hertfordshire.—School (576 places), Cat Hill, East Barnet Valley, for the county E.C.; A. E. Prescott, county architect, Hatfield.

Kent.—Schools, Aylesford, Aylesham, and Hadlow, for the county E.C.; director of education, Maidstone.

Keswick.—Extensions to premises of the Co-operative Wholesale Society (£80,000); J. & R. Hodgson, builders.

Kingston-on-Thames.—Houses (40) for the T.C.; borough surveyor.

Lancashire.—Schools, Litherland, Rishton, Walmer Bridge, and new premises for Pendleton High School, Salford; director of education, Education Offices, Chapel Street.

Leaholm (YORKS.).—R.C. church; W. R. Robinson, architect, Glaisdale.

Lincoln.—Re-erection of portion of factory for H. Poppleton and Sons (£3,000).

Liverpool.—Cinema, Green Lane; C. J. Doyle, builders, 15, Victoria Street.

London.—(CAMBERWELL).—School (640 places), Dog Kennel Hill; L.C.C. architect. (CAMDEN TOWN).—Enlargement, Camden School for Girls (£7,500); governors. (CROUCH END).—Clinic, Broadway (£5,000), for the Hornsey E.C. Shops and flats, Crouch Hill End; H. J. White, 405, Holloway Road, N.7. (DEPTFORD).—Enlargement, Addey and Stanhope School (£12,000); governors Improvements to Aske's Hatcham Grammar School (£6,850); governors. (EAST HAM).—School, Altmore Avenue, for the borough E.C.; A. T. Bridgewater, borough engineer. (FULHAM).—Rebuilding of 474, Fulham Road, for Lloyds Bank, Ltd.; A. G. Johnson. Addition to Town Hall, &c. (£19,776); W. Cave, 132a, Cromwell Road, S.W.7. (GREENWICH).—New block, St. Alfege's Hospital (£39,000); L.C.C. architect. Offices, restaurant, showrooms, &c., Woolwich Road; T. Enticknay & Sons. (HACKNEY).—Clearance scheme, Banister Street area; borough engineer. Extensions, poor law hospital (£44,000); L.C.C. architect. Remodelling, Sidney Road School (£9,180); L.C.C. architect. (HORNSEY).—Additions, Hornsey Central Hospital, Park Road; J. M. Lethbridge, 205, Archway Road, Highgate, N. (ILFORD).—Middle school, Downshall, for the borough E.C.; L. E. J. Reynolds, architect, Town Hall. (LEE).—Development, Win estate; Newton & Lewin. (LEYTON).—School (720 places), Connaught Road, for the E.C. (LIMEHOUSE).—Alterations and additions, Our Lady School; R.C. trustees. Reconstruction, Central School, St. Thomas Street (£23,500); L.C.C. architect. (PADDINGTON).—Improvements, Technical Institute (£10,000); L.C.C. architect. (POPLAR).—Hall and Municipal Offices, Bow Road (£130,000); borough engineer. Shops, St. Leonard's Road and Bright Street; London Co-operative Society, Ltd. (PUTNEY).—Factory, Upper Richmond Road; H. Butcher & Co. (ROTHERHITHE).—Remodelling, Albion Street School (£24,000); L.C.C. architect. (ST. PANCRAS).—Improvements, Acland and Burghley schools (£5,000); L.C.C. architect. (EALING).—Showrooms and offices for the electricity committee at "Copley Dene" (£11,990); W. J. Dickens, contractor. Library, Greenford, for the T.C. (£6,500); borough surveyor. (MILE END).—Reconditioning of poor law hospital (£4,725); L.C.C. architect. (WEST HAM).—School, Tollgate, for the E.C. (£37,720); F. J. Coxhead, contractor, Leytonstone. (WOOLWICH).—Houses (400), Middle Park estate (£156,000); borough engineer.

Manchester.—Shops and business premises, Wythenshawe Road, Northenden, for the Corporation; city architect, Town Hall.

Mansfield.—Clearance scheme, Stockwell Gate area; borough engineer.

Morecambe.—Library, Queen Street (£15,000); county architect.

Newcastle-on-Tyne.—Church, Seaton Hirst; Knowles, Oliver and Leeson, architects, 14, Ellison Place. School at Cragside, High Heaton, for the E.C.; A. K. Tasker, architect, Trinity Buildings.

New Malden and Coombe (SURREY).—Houses (20), Long Walk, for the U.D.C.; H. & L. Slogett, builders.

Newport (SALOP).—Houses (40), Donnington Wood, for the R.D.C.; Mr. Riley, architect.

Northampton.—Branch library, Southampton Road; borough engineer.

North Riding.—School (400 places), Tang Hall, York, for the county E.C.

Oldham.—St. Matthew's and St. Aidan's Church, Roundthorn, for the Rev. B. A. Whitford, 323, Lees Road, and Parochial Council; Taylor & Young, architects, 19, Chapel Walks, Manchester.

Penrith.—Houses (120), Castle Hill (£45,000); U.D.C. surveyor. Alterations, Devonshire Street; Boots, Ltd.

Perivale (MIDDLESEX).—Factory, for Hoover, Ltd., Regent Street, London.

Portland.—Houses (20) for the U.D.C.; surveyor.

Rye (SUSSEX).—Houses (44) for the R.D.C.; H. M. Jeffery, architect, 51, Havelock Road, Hastings.

Shropshire.—School, Oswestry, for the county E.C.; director of education.

Southam (WARWICKSHIRE).—Houses (24) for the R.D.C.; Bosworth & Wakeford, Ltd.

Southend-on-Sea.—Conversion of premises to headquarters of Royal Literary Institution (£6,820) for the T.C.; Amery & Son, builders.

South Shields.—Houses (236) at south end of Dean Road and Tyne Dock Station, High School (550 places), and conversion of Westoe Secondary School (480 places), for the T.C.; J. P. Watson, borough surveyor, Town Hall. Extension of Ingham Infirmary (£50,000); Cackett, Burns, Dick & Mackellar, architects, 21, Ellison Place, Newcastle-on-Tyne.

Stoke-on-Trent.—Institute, Stoke Lodge estate; Sutton Dwellings Trust.

Thorne (YORKS.).—Houses (100), Moor Ends, for the R.D.C.; surveyor.

Todmorden.—New Olympia Cinema (1,200 seats); Mullen and Durkin, Ltd., builders, 140, Trafalgar Street, Burnley.

Wells (SOMERSET).—Houses (40) for the T.C.; Petter and Warren, architects, Old Sarum, Yeovil.

Welwyn (HERTS.).—Public offices (£9,450) for the R.D.C.; surveyor.

West Riding.—Schools, Askern, Castleford, Maltby, and Moss Road, Askern, for the C.C.; county architect, Wakefield.

Willenhall (STAFFS.).—Factory for the Willenhall Motor Radiator Co.

York.—Houses (32), Westwood Terrace; Relton & Co. Abattoir, Kent Street (£18,500); city architect. Shopping centre, Burnholme estate, Heworth; J. N. Dunn.